SO3P0867US00
10/521331

FIG. 1

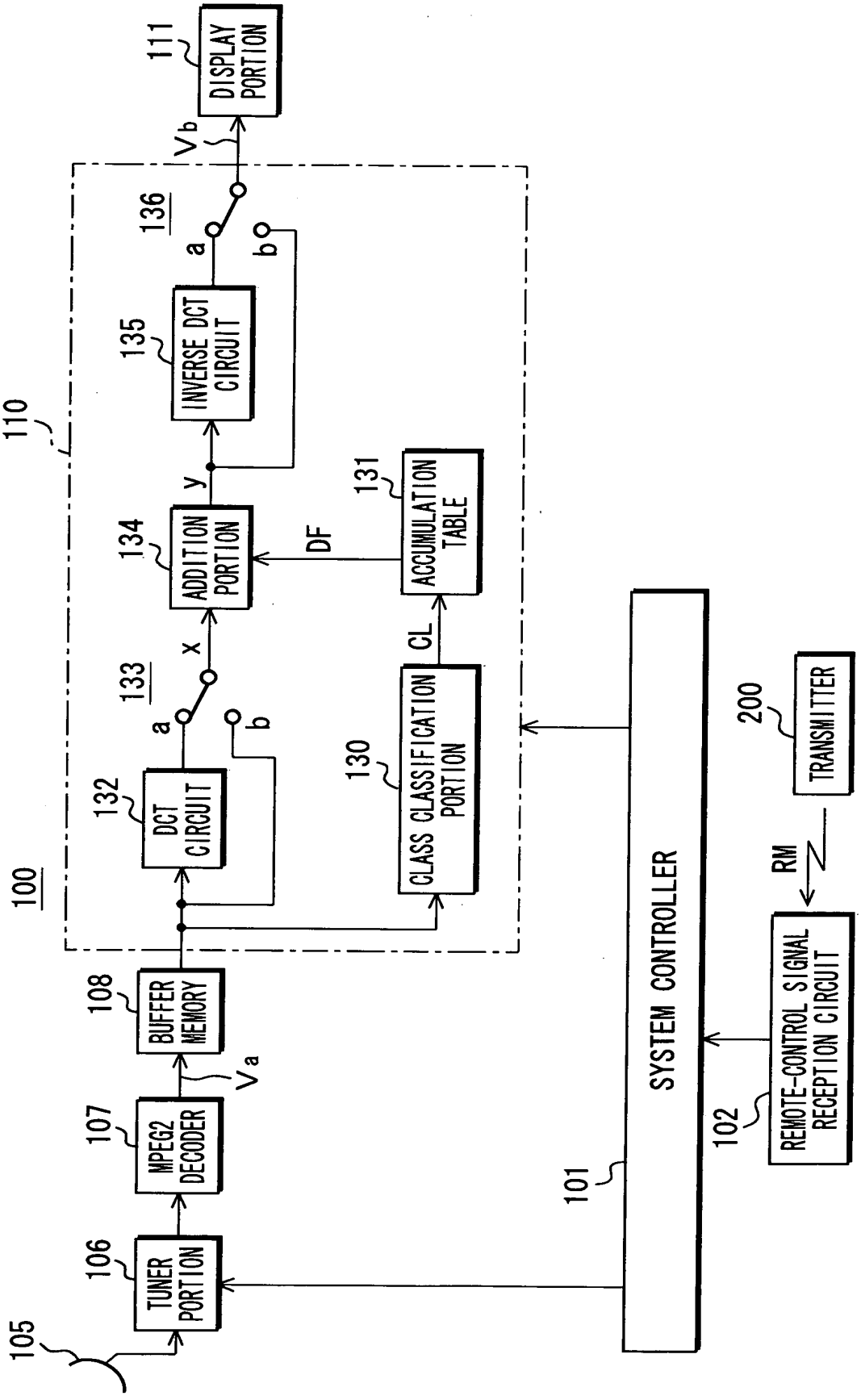


FIG. 2

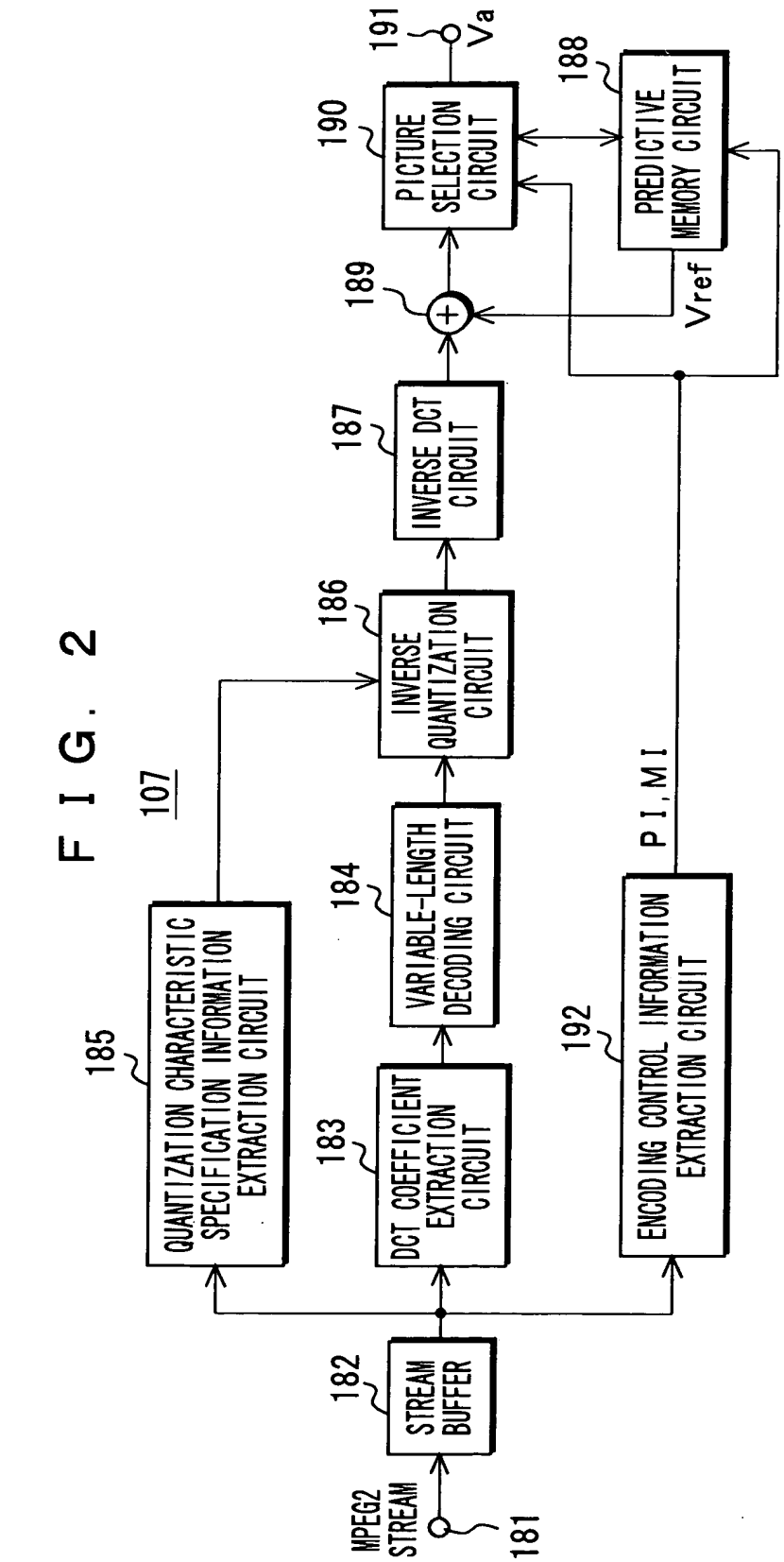

MPEG2 STREAM
181
STREAM BUFFER
182
DCT COEFFICIENT EXTRACTION CIRCUIT
183
VARIABLE-LENGTH DECODING CIRCUIT
184
INVERSE QUANTIZATION CIRCUIT
186
INVERSE DCT CIRCUIT
187
PREDICTIVE MEMORY CIRCUIT
188
PICTURE SELECTION CIRCUIT
190
Va
191
Vref
189
ENCODING CONTROL INFORMATION EXTRACTION CIRCUIT
192
PI, MI
QUANTIZATION CHARACTERISTIC SPECIFICATION INFORMATION EXTRACTION CIRCUIT
185
107

FIG. 3

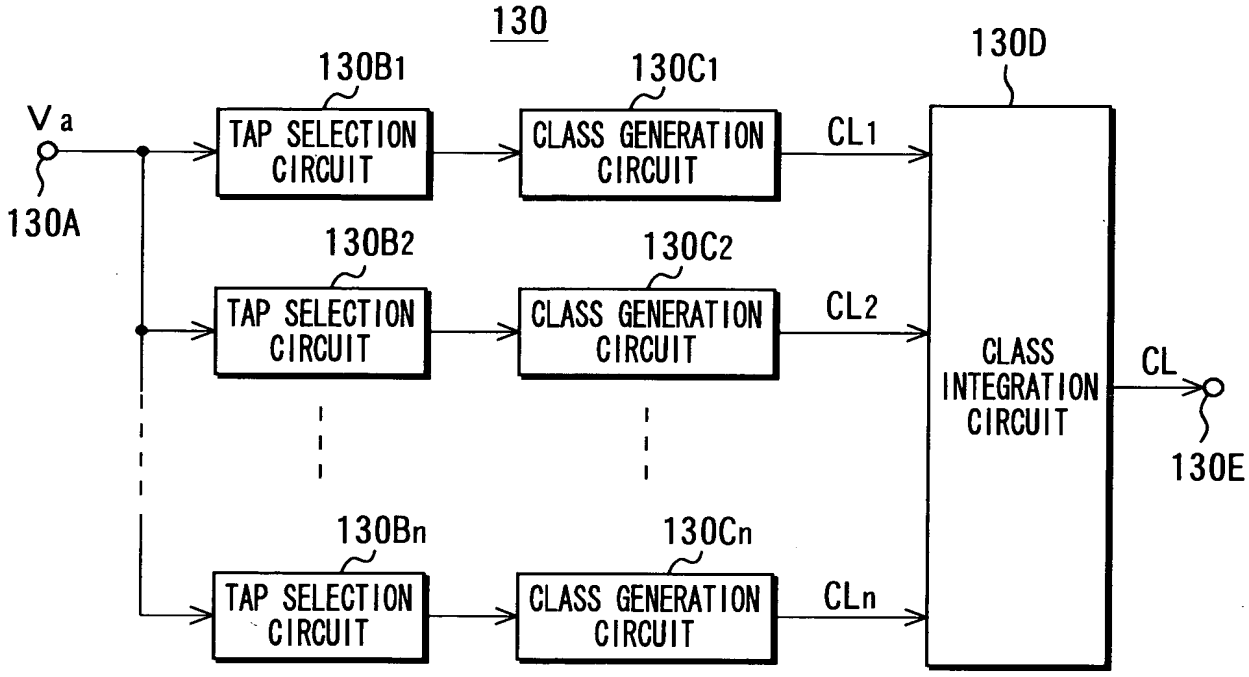

130
130B1
130C1
130D
Va
TAP SELECTION CIRCUIT
CLASS GENERATION CIRCUIT
CL1
130A
130B2
130C2
TAP SELECTION CIRCUIT
CLASS GENERATION CIRCUIT
CL2
CLASS INTEGRATION CIRCUIT
CL
130E
130Bn
130Cn
TAP SELECTION CIRCUIT
CLASS GENERATION CIRCUIT
CLn

FIG. 4

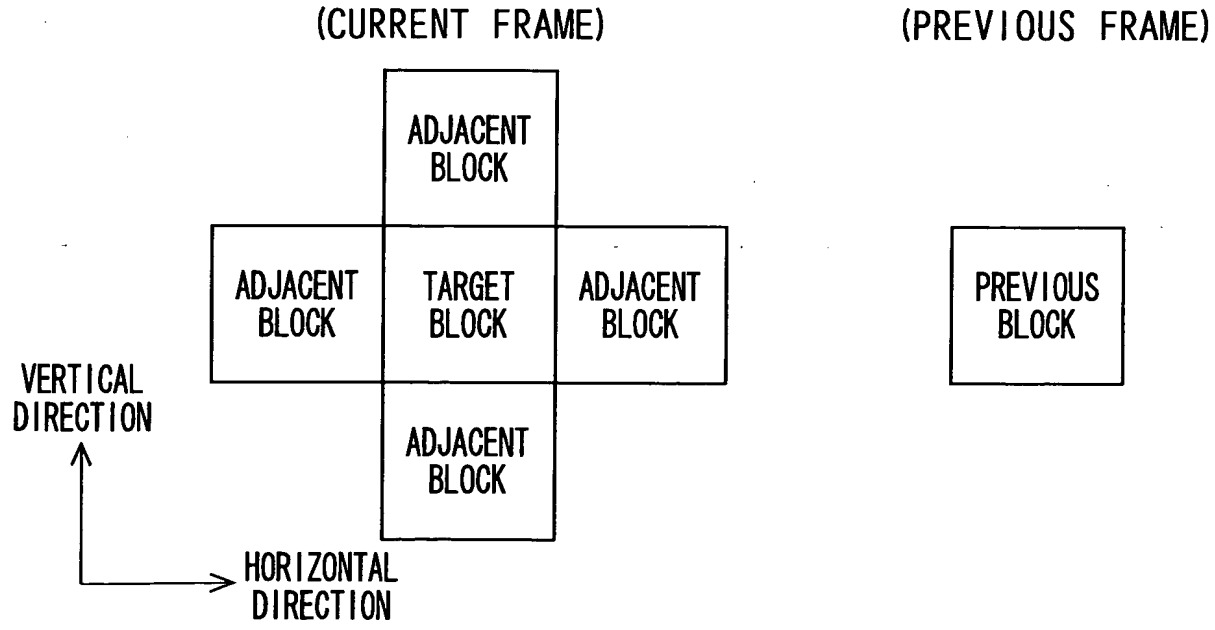

(CURRENT FRAME)
(PREVIOUS FRAME)
ADJACENT BLOCK
ADJACENT BLOCK
TARGET BLOCK
ADJACENT BLOCK
ADJACENT BLOCK
PREVIOUS BLOCK
VERTICAL DIRECTION
HORIZONTAL DIRECTION

FIG. 5

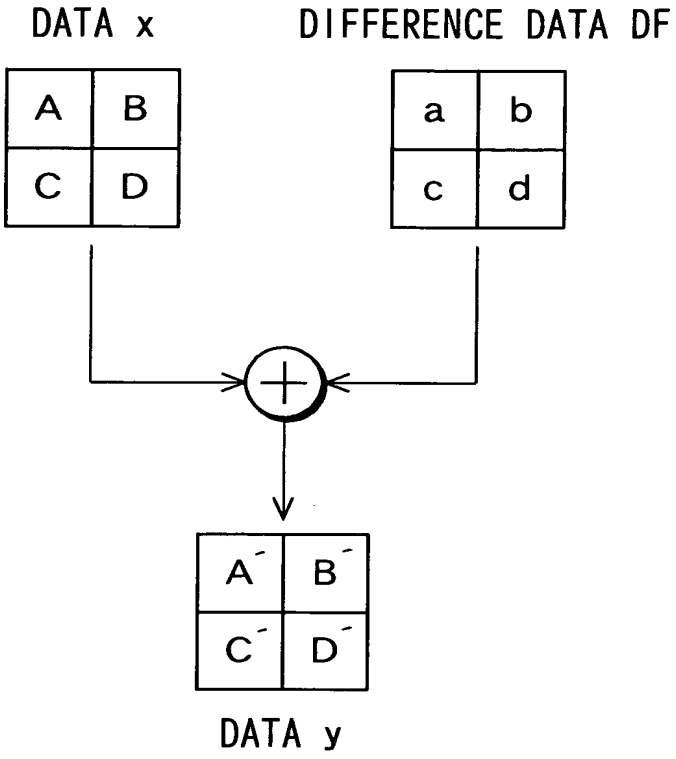


FIG. 6

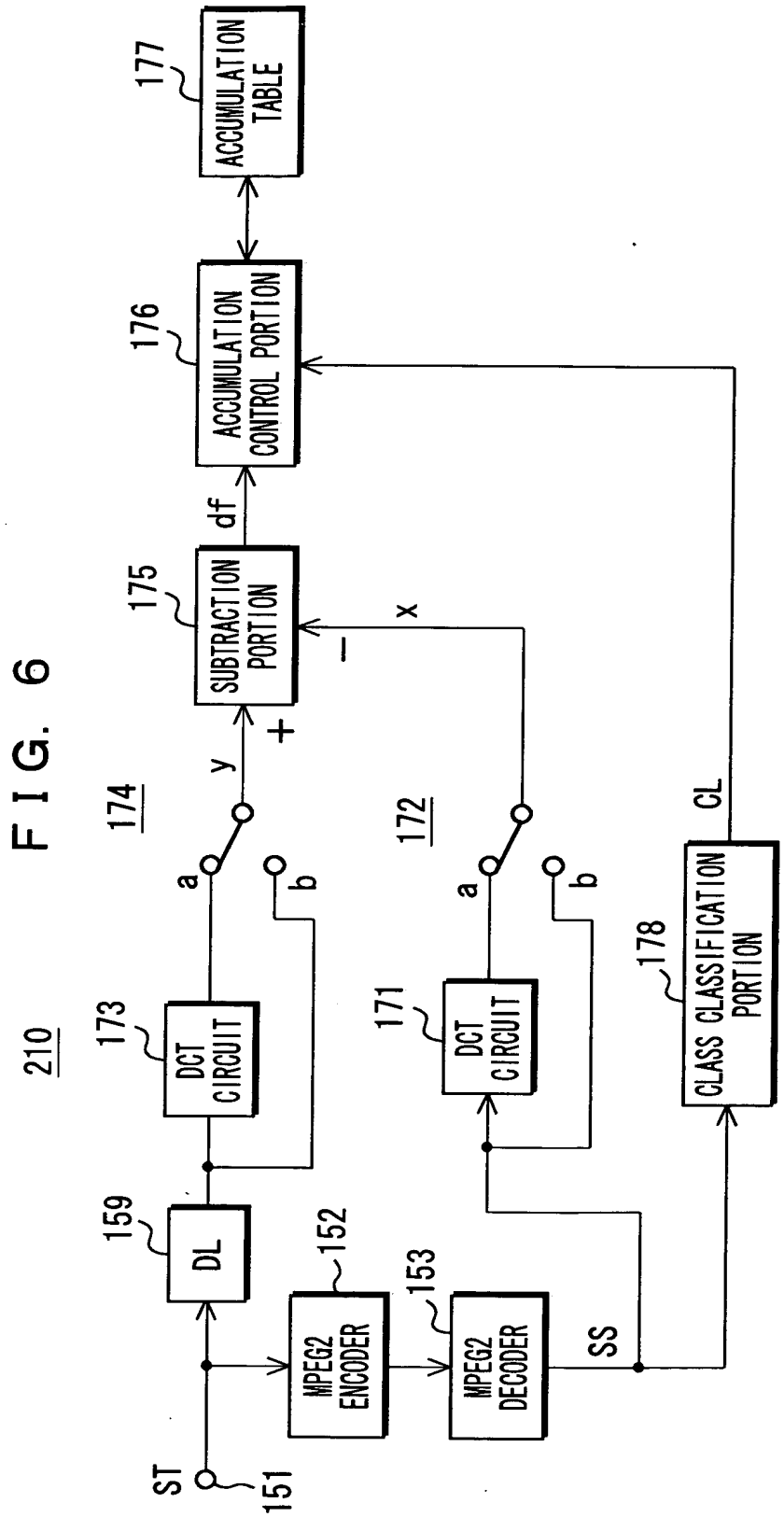

210
ST
151
159
DL
152
MPEG2 ENCODER
153
MPEG2 DECODER
SS
173
DCT CIRCUIT
171
DCT CIRCUIT
178
CLASS CLASSIFICATION PORTION
CL
174
172
a
b
y
x
+
−
175
SUBTRACTION PORTION
df
176
ACCUMULATION CONTROL PORTION
177
ACCUMULATION TABLE

FIG. 7

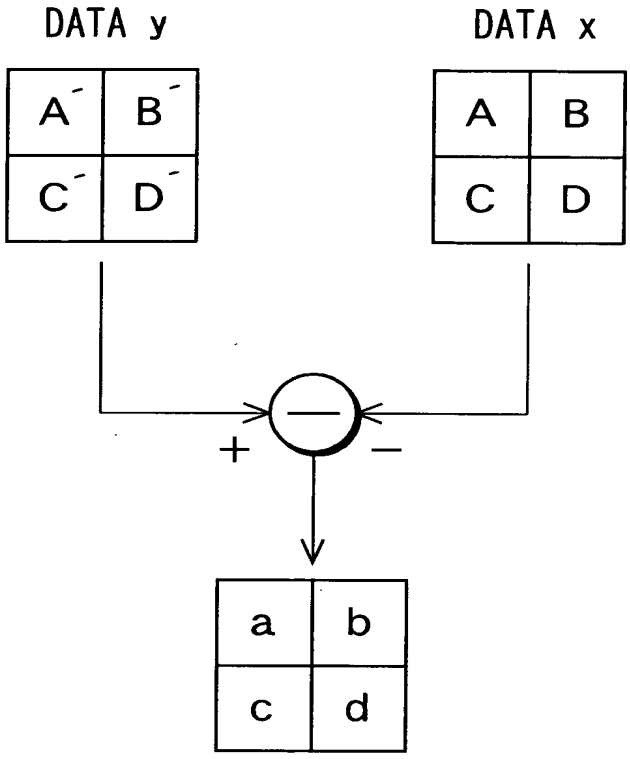


FIG. 8

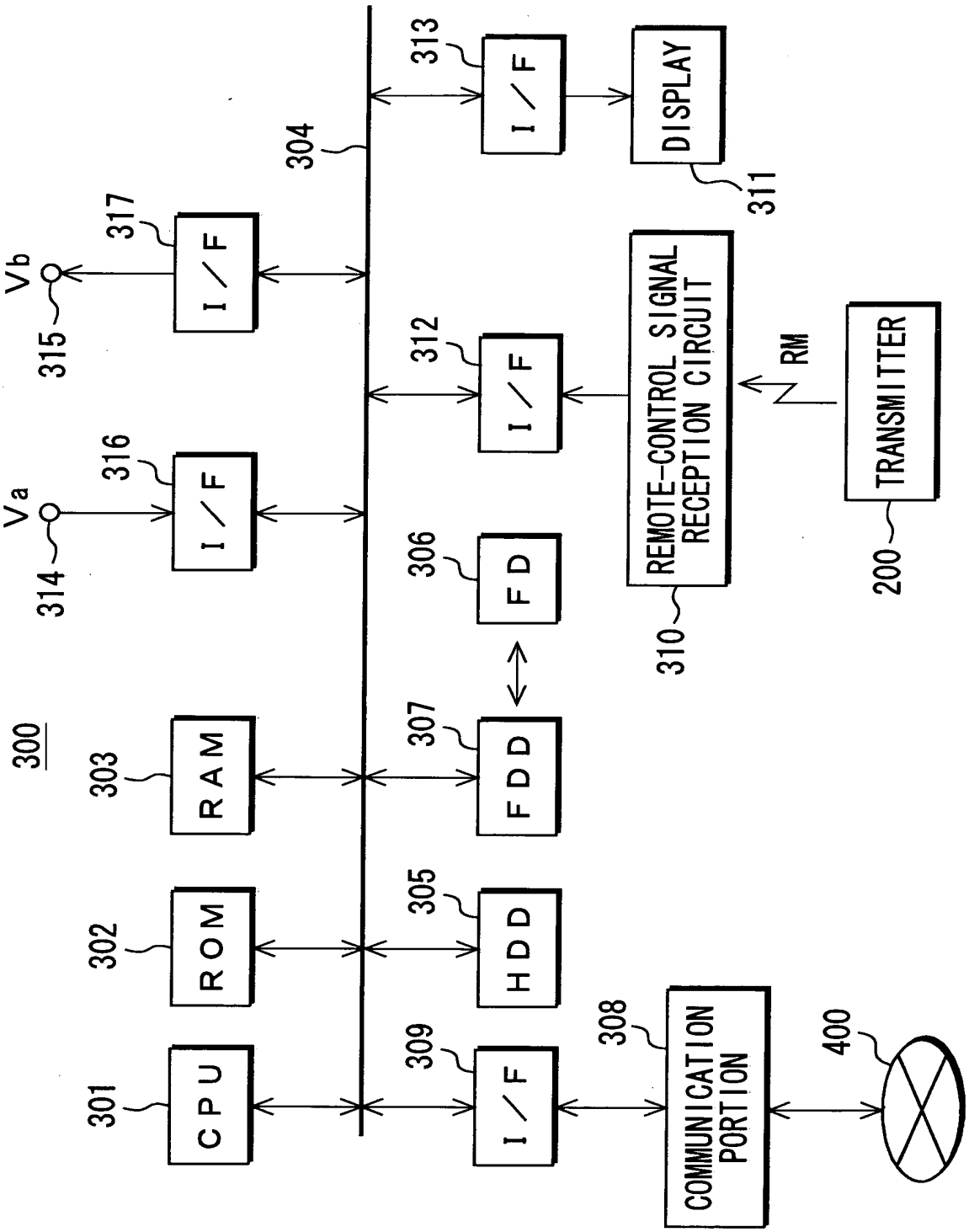

300
CPU
301
ROM
302
RAM
303
HDD
305
FDD
307
FD
306
I／F
309
COMMUNICATION PORTION
308
400
I／F
313
DISPLAY
311
I／F
312
REMOTE-CONTROL SIGNAL RECEPTION CIRCUIT
310
RM
TRANSMITTER
200
I／F
316
Va
314
I／F
317
Vb
315
304

FIG. 9

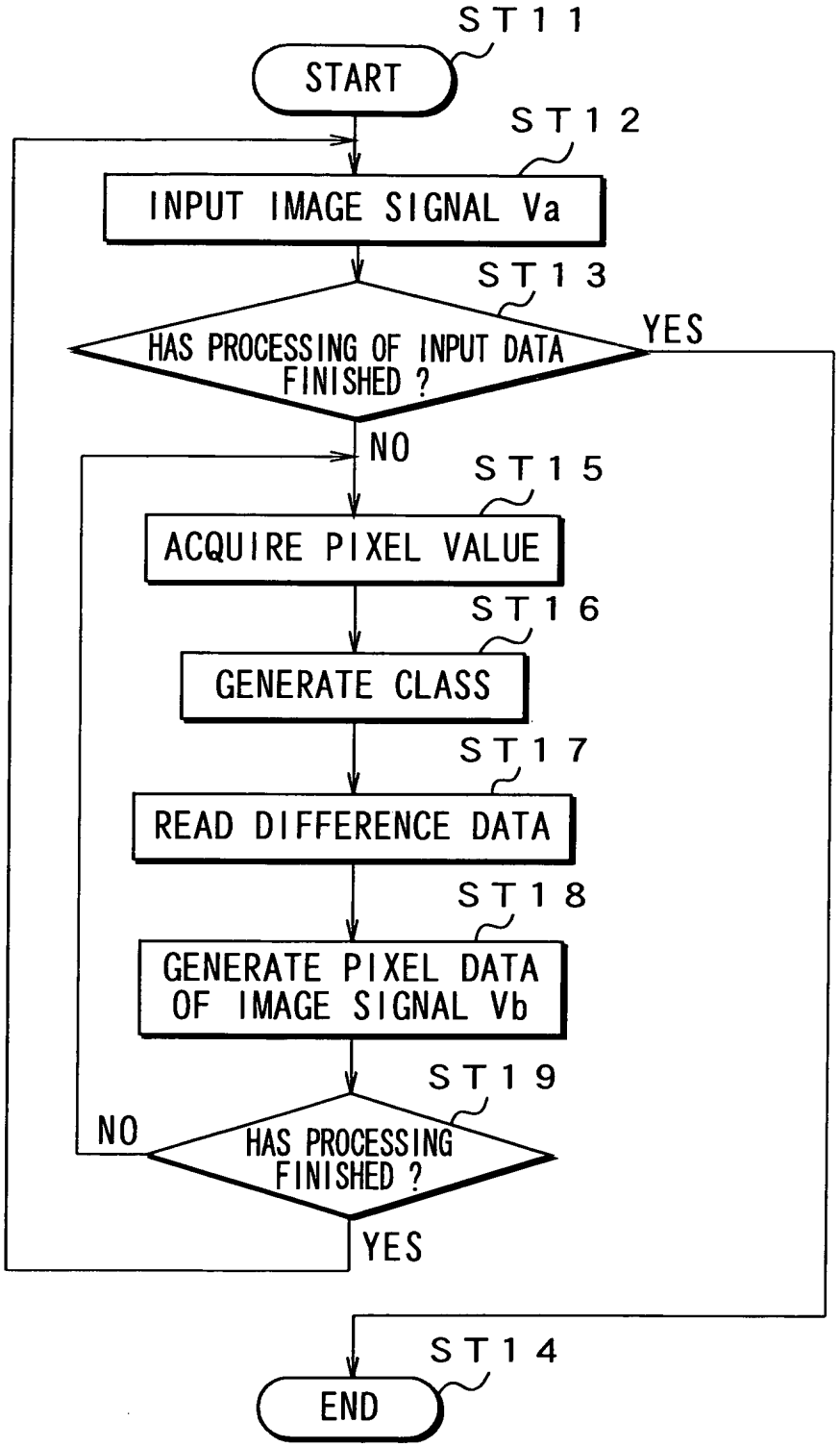

ST11
START
ST12
INPUT IMAGE SIGNAL Va
ST13
HAS PROCESSING OF INPUT DATA FINISHED ?
YES
NO
ST15
ACQUIRE PIXEL VALUE
ST16
GENERATE CLASS
ST17
READ DIFFERENCE DATA
ST18
GENERATE PIXEL DATA OF IMAGE SIGNAL Vb
ST19
NO
HAS PROCESSING FINISHED ?
YES
ST14
END

FIG. 10

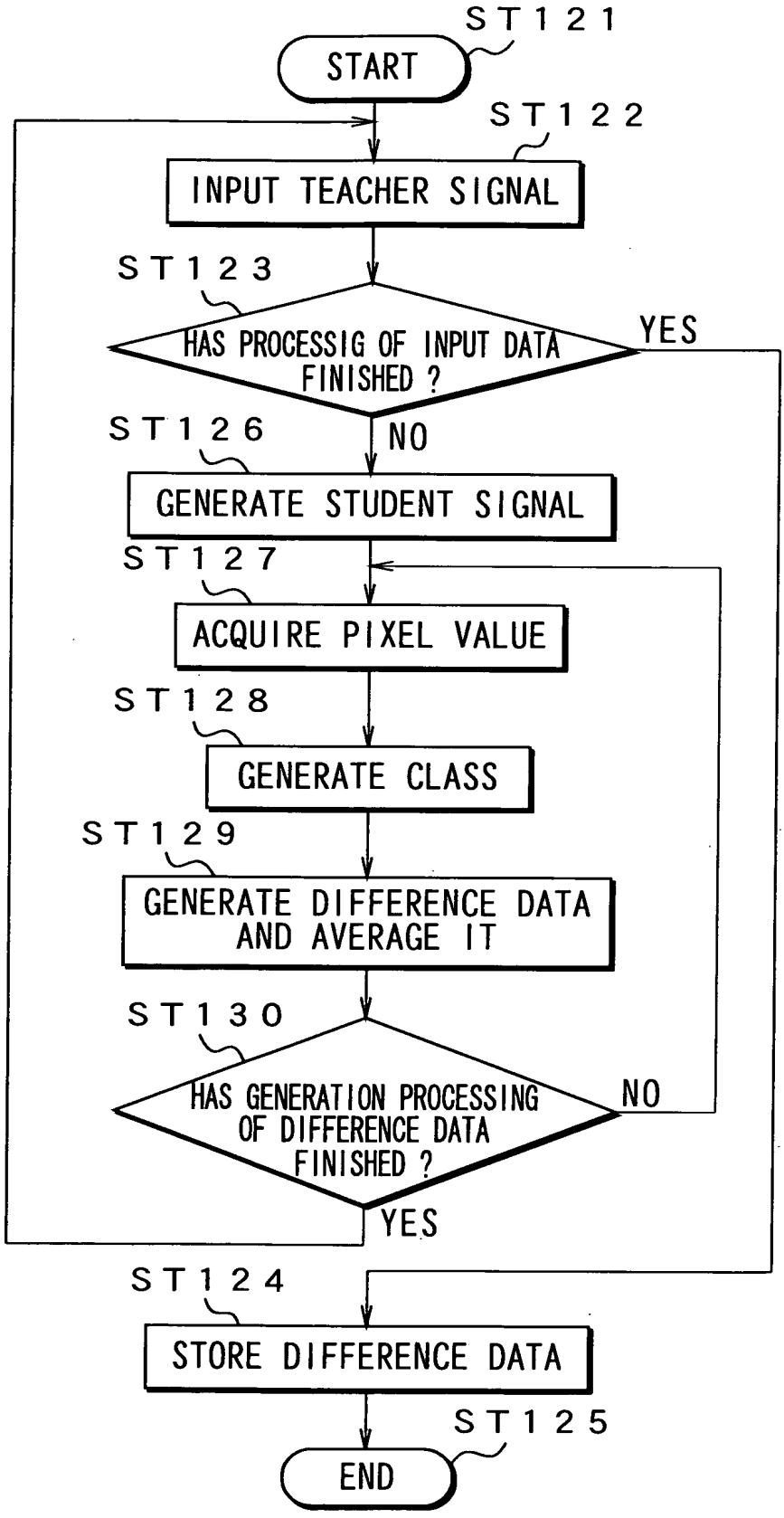

ST121
START
ST122
INPUT TEACHER SIGNAL
ST123
HAS PROCESSIG OF INPUT DATA FINISHED ?
YES
NO
ST126
GENERATE STUDENT SIGNAL
ST127
ACQUIRE PIXEL VALUE
ST128
GENERATE CLASS
ST129
GENERATE DIFFERENCE DATA AND AVERAGE IT
ST130
HAS GENERATION PROCESSING OF DIFFERENCE DATA FINISHED ?
NO
YES
ST124
STORE DIFFERENCE DATA
ST125
END

FIG. 11

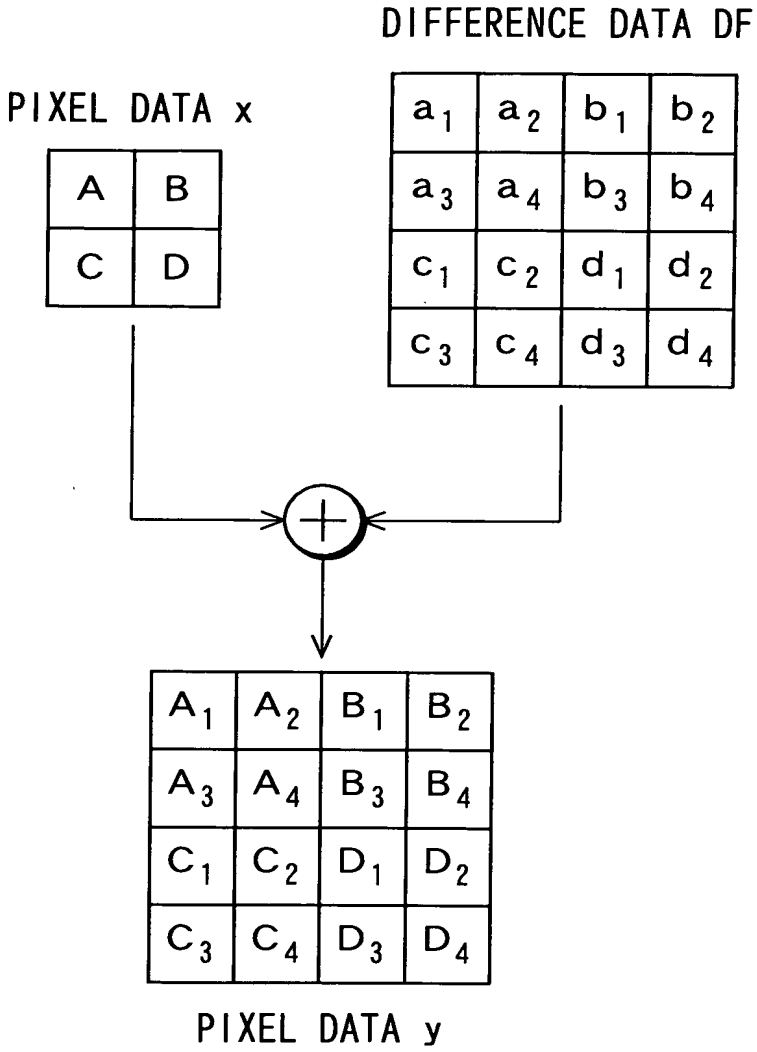

DIFFERENCE DATA DF
PIXEL DATA x
A
B
C
D
a_1 a_2 b_1 b_2
a_3 a_4 b_3 b_4
c_1 c_2 d_1 d_2
c_3 c_4 d_3 d_4
A_1 A_2 B_1 B_2
A_3 A_4 B_3 B_4
C_1 C_2 D_1 D_2
C_3 C_4 D_3 D_4
PIXEL DATA y

FIG. 12

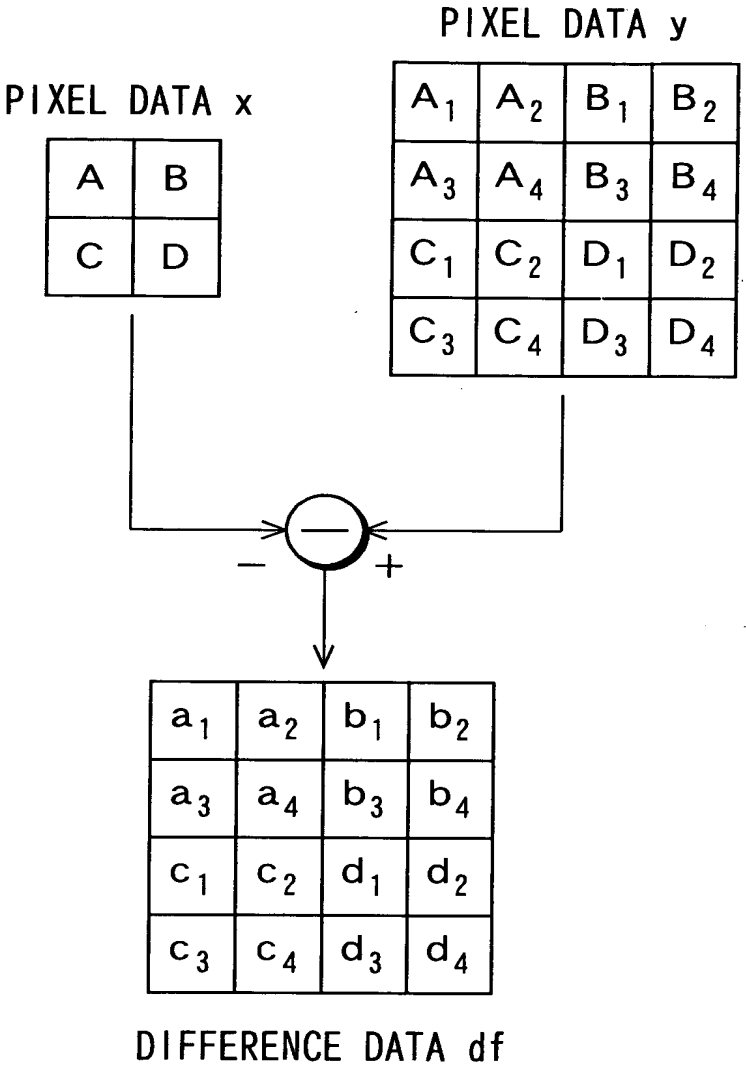

PIXEL DATA x
A B
C D
PIXEL DATA y
A_1 A_2 B_1 B_2
A_3 A_4 B_3 B_4
C_1 C_2 D_1 D_2
C_3 C_4 D_3 D_4
−
+
a_1 a_2 b_1 b_2
a_3 a_4 b_3 b_4
c_1 c_2 d_1 d_2
c_3 c_4 d_3 d_4
DIFFERENCE DATA df

FIG. 13

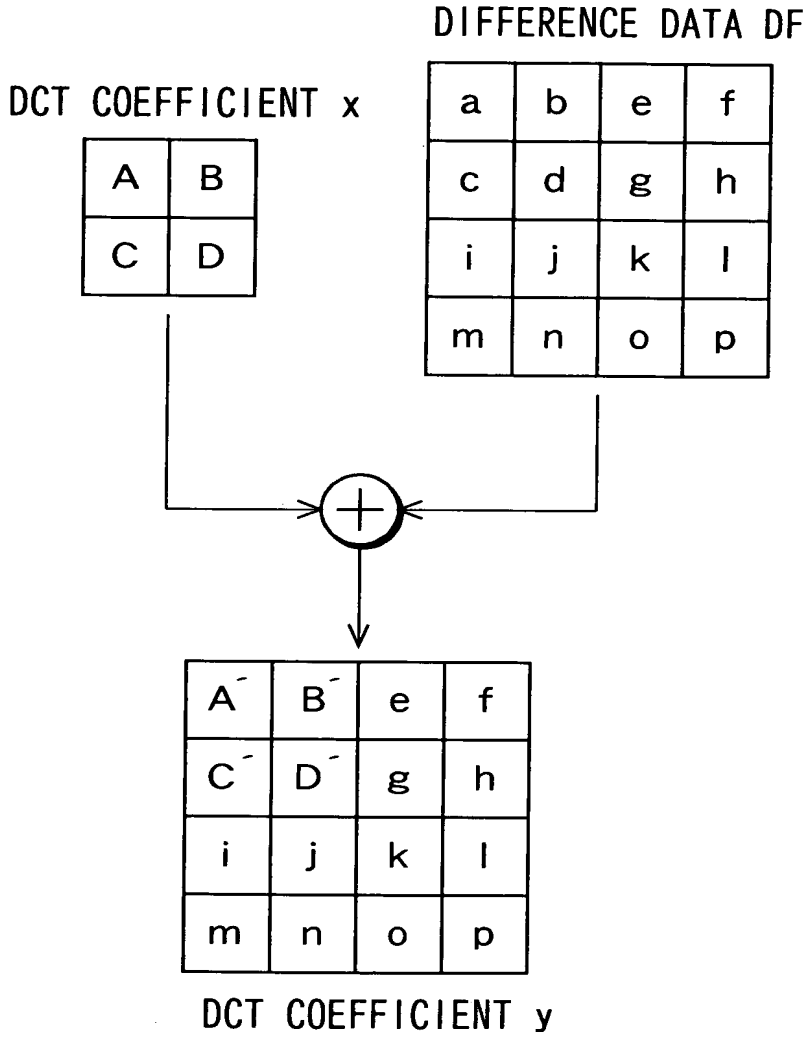

DIFFERENCE DATA DF
DCT COEFFICIENT x
A
B
C
D
a
b
e
f
c
d
g
h
i
j
k
l
m
n
o
p
A˝
B˝
e
f
C˝
D˝
g
h
i
j
k
l
m
n
o
p
DCT COEFFICIENT y

FIG. 14

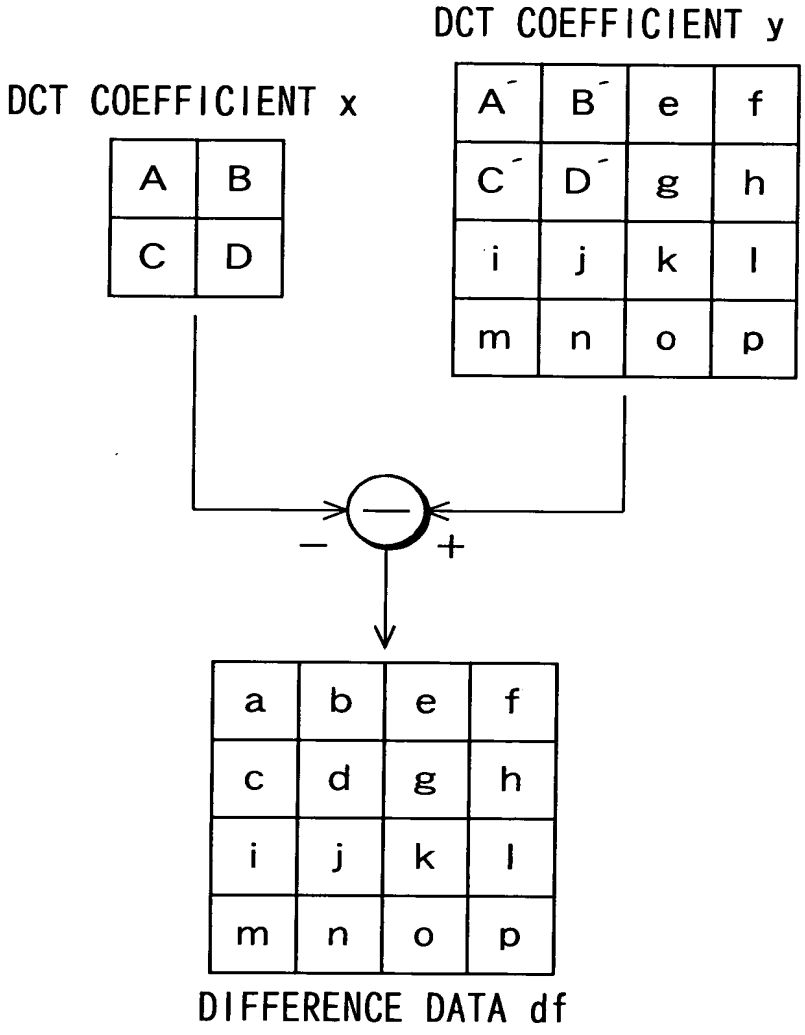

DCT COEFFICIENT y
DCT COEFFICIENT x
A B
C D
A' B' e f
C' D' g h
i j k l
m n o p
−
+
a b e f
c d g h
i j k l
m n o p
DIFFERENCE DATA df

FIG. 15

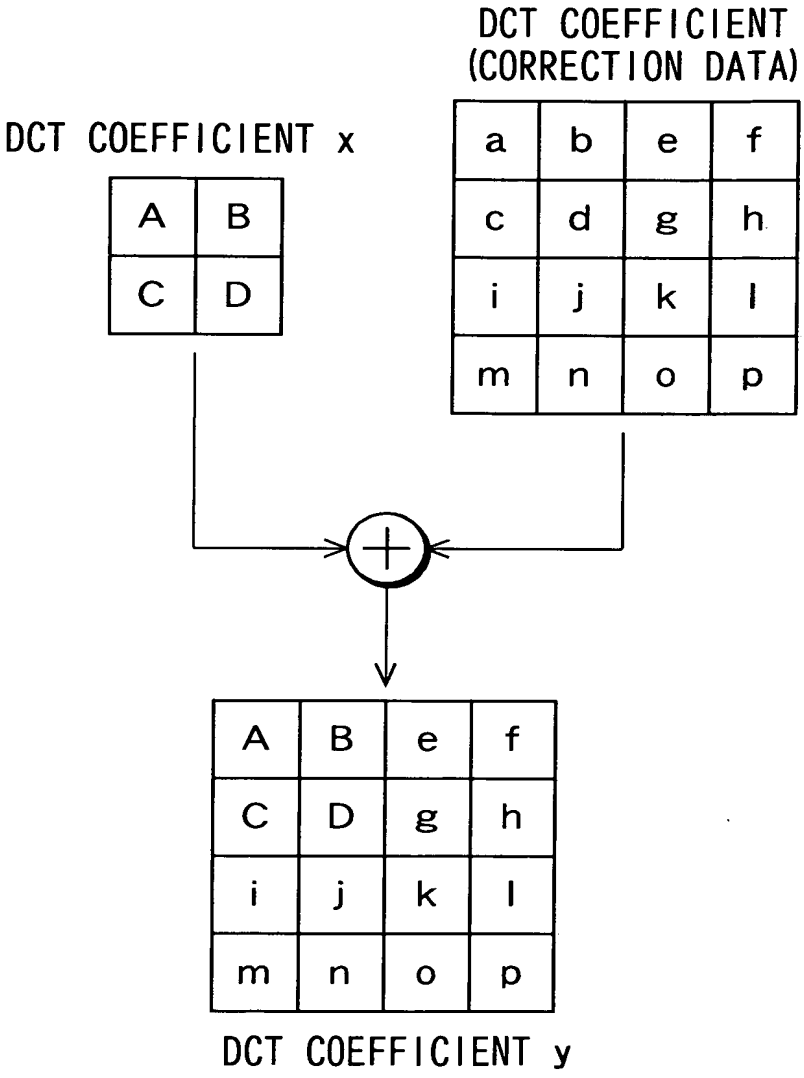

DCT COEFFICIENT
(CORRECTION DATA)
DCT COEFFICIENT x
A B
C D
a b e f
c d g h
i j k l
m n o p
A B e f
C D g h
i j k l
m n o p
DCT COEFFICIENT y

FIG. 16

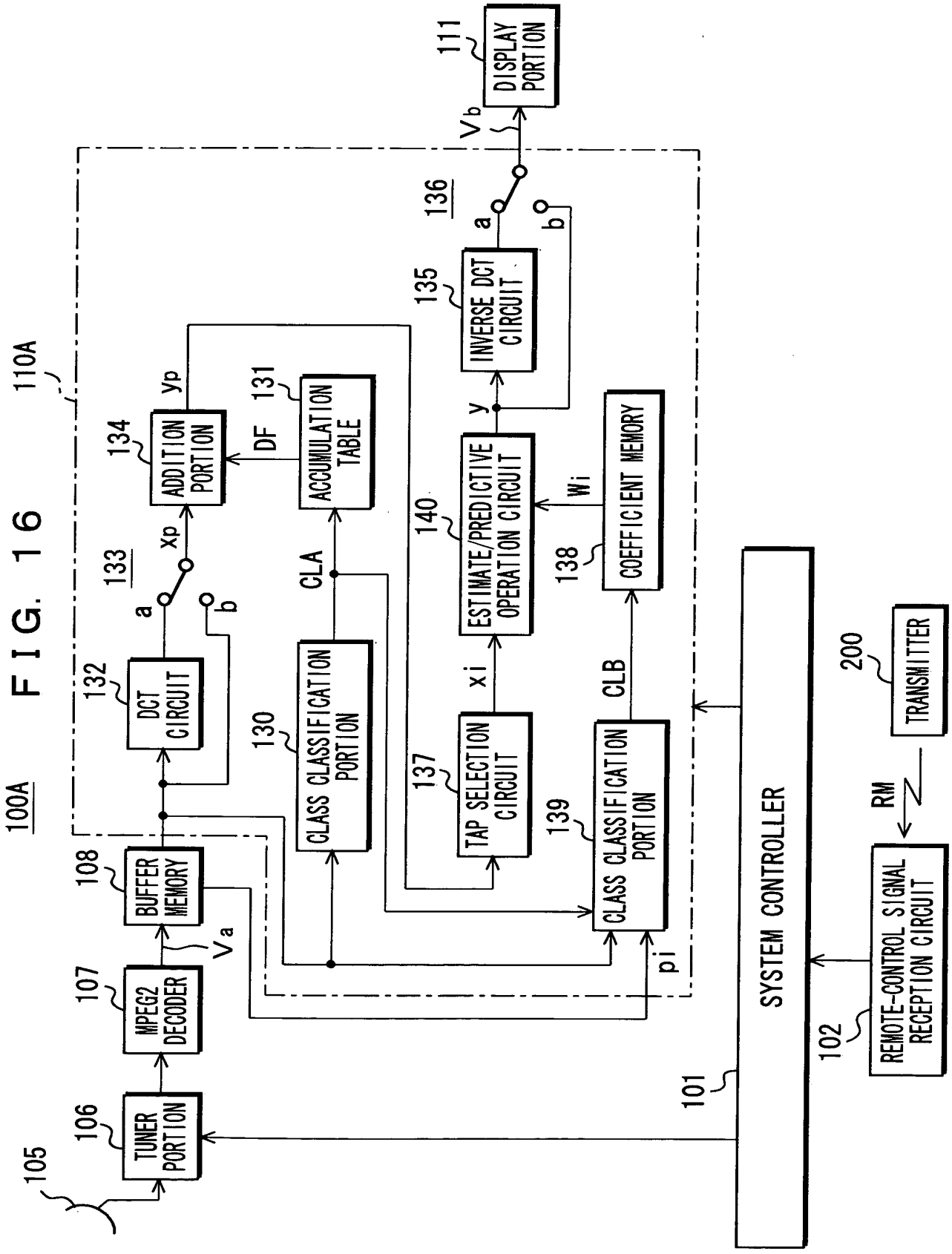

100A
110A
105
TUNER PORTION
106
MPEG2 DECODER
107
BUFFER MEMORY
108
Va
DCT CIRCUIT
132
a
b
133
xp
ADDITION PORTION
134
yp
DF
ACCUMULATION TABLE
131
CLA
CLASS CLASSIFICATION PORTION
130
xi
TAP SELECTION CIRCUIT
137
CLB
CLASS CLASSIFICATION PORTION
139
pi
ESTIMATE/PREDICTIVE OPERATION CIRCUIT
140
Wi
COEFFICIENT MEMORY
138
y
INVERSE DCT CIRCUIT
135
136
Vb
DISPLAY PORTION
111
SYSTEM CONTROLLER
101
REMOTE-CONTROL SIGNAL RECEPTION CIRCUIT
102
RM
TRANSMITTER
200

FIG. 17

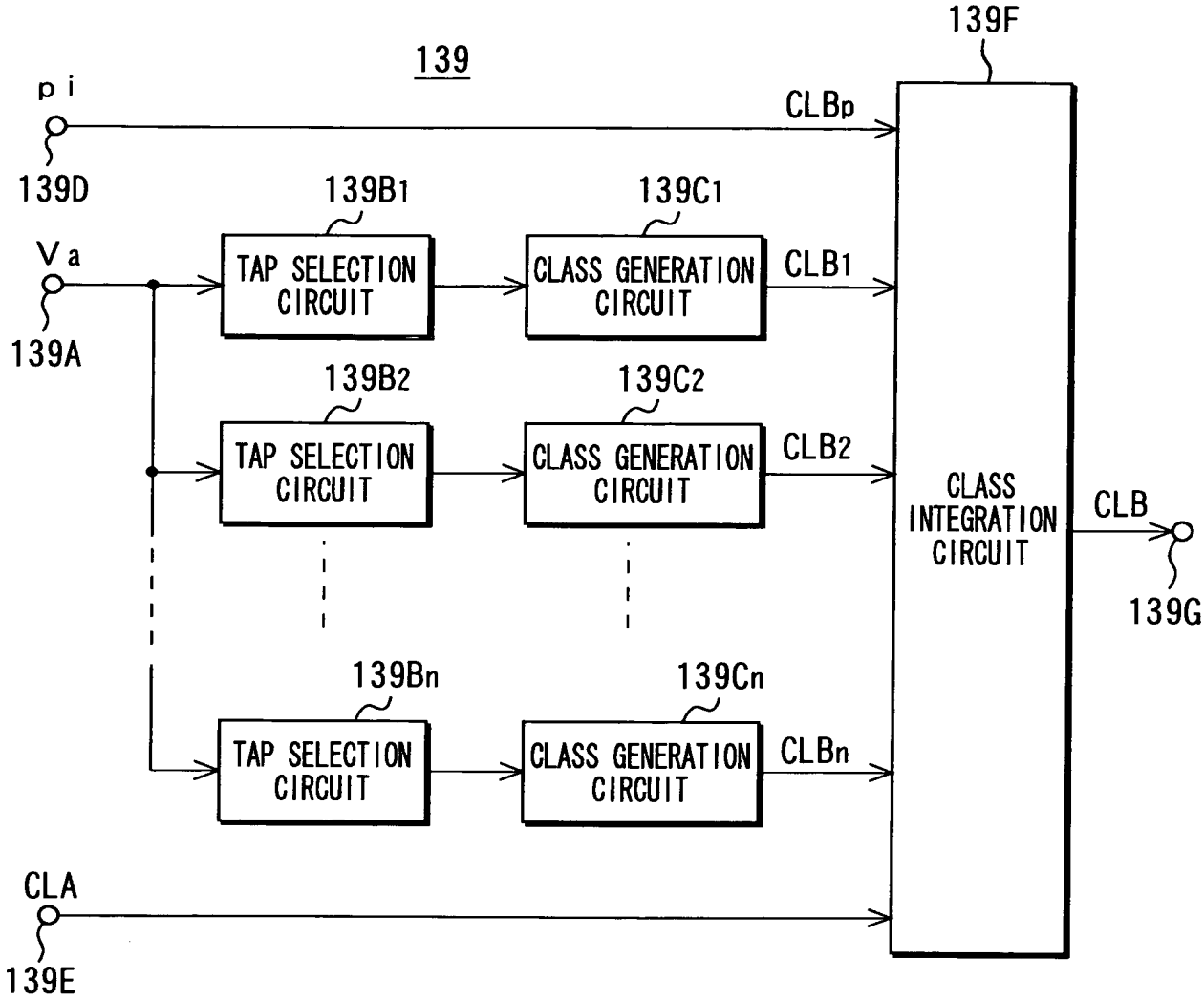

139
139F
pi
CLBp
139D
139B1
139C1
Va
TAP SELECTION CIRCUIT
CLASS GENERATION CIRCUIT
CLB1
139A
139B2
139C2
TAP SELECTION CIRCUIT
CLASS GENERATION CIRCUIT
CLB2
CLASS INTEGRATION CIRCUIT
CLB
139G
139Bn
139Cn
TAP SELECTION CIRCUIT
CLASS GENERATION CIRCUIT
CLBn
CLA
139E

FIG. 18

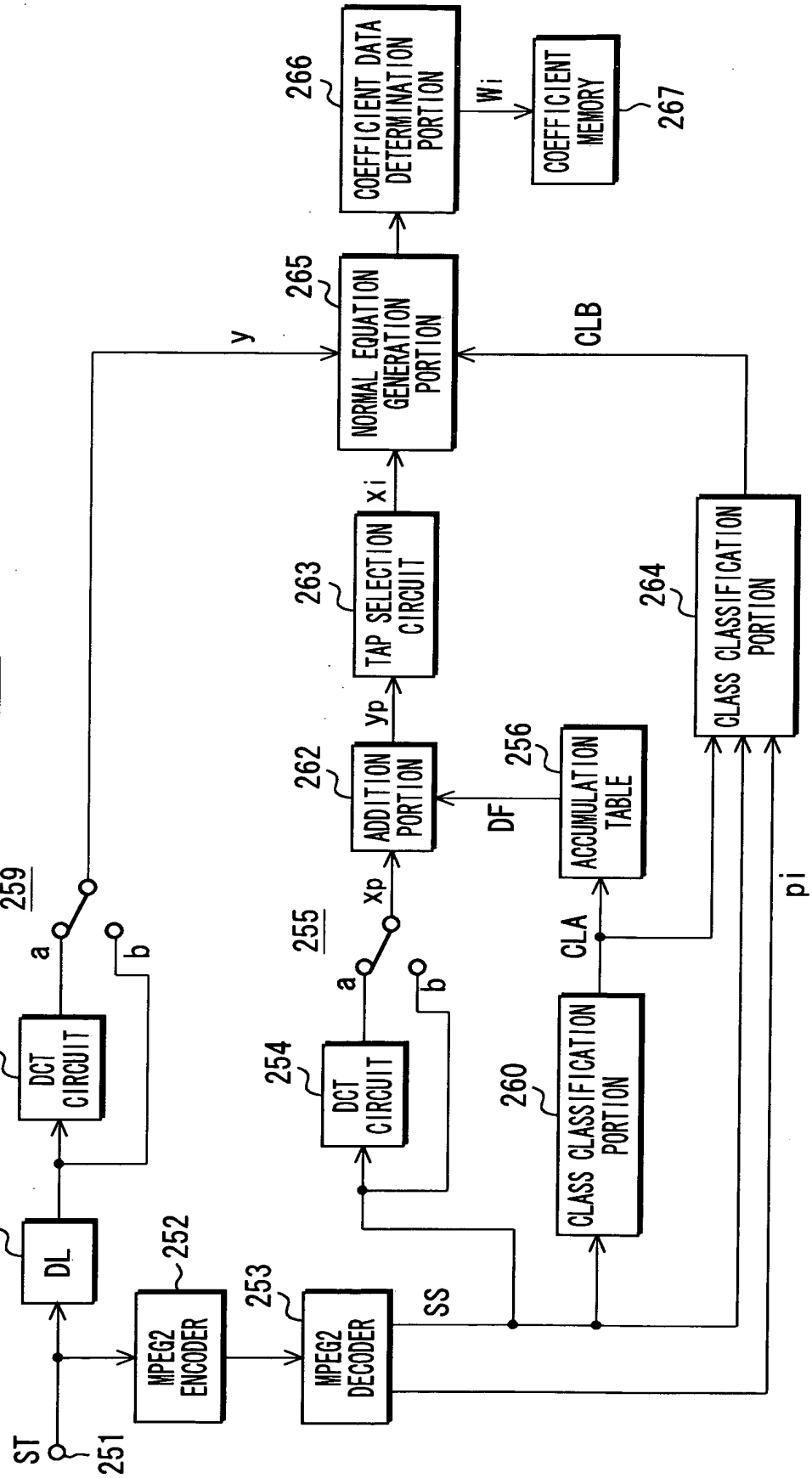
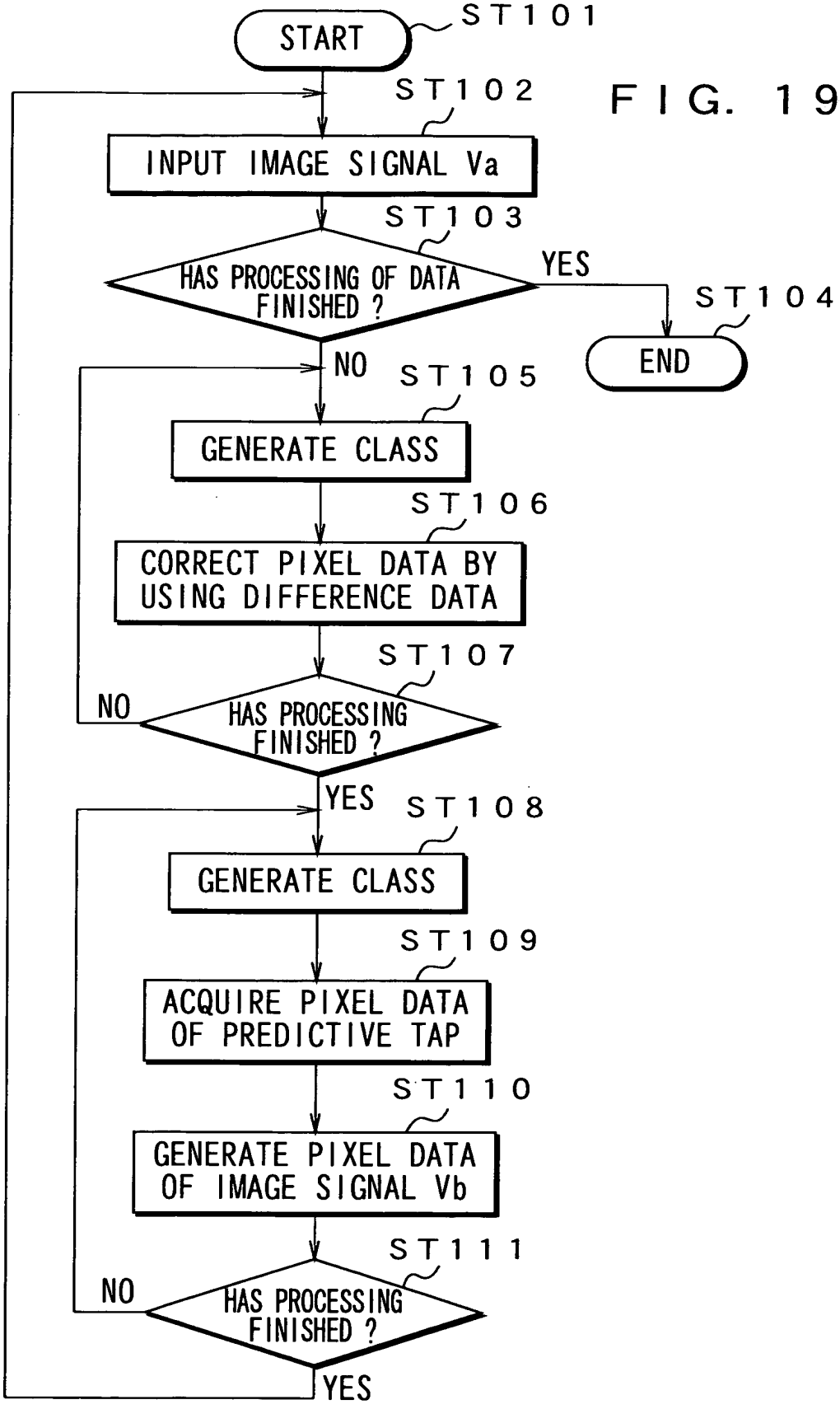

250A
ST
251
MPEG2 ENCODER
252
MPEG2 DECODER
253
DL
257
DCT CIRCUIT
258
259
a
b
DCT CIRCUIT
254
255
a
b
xp
ADDITION PORTION
262
yp
TAP SELECTION CIRCUIT
263
xi
NORMAL EQUATION GENERATION PORTION
265
COEFFICIENT DATA DETERMINATION PORTION
266
Wi
COEFFICIENT MEMORY
267
y
CLB
CLASS CLASSIFICATION PORTION
264
ACCUMULATION TABLE
256
DF
CLASS CLASSIFICATION PORTION
260
CLA
SS
pi

FIG. 19


START
ST101
ST102
INPUT IMAGE SIGNAL Va
ST103
HAS PROCESSING OF DATA FINISHED ?
YES
ST104
END
NO
ST105
GENERATE CLASS
ST106
CORRECT PIXEL DATA BY USING DIFFERENCE DATA
ST107
NO
HAS PROCESSING FINISHED ?
YES
ST108
GENERATE CLASS
ST109
ACQUIRE PIXEL DATA OF PREDICTIVE TAP
ST110
GENERATE PIXEL DATA OF IMAGE SIGNAL Vb
ST111
NO
HAS PROCESSING FINISHED ?
YES

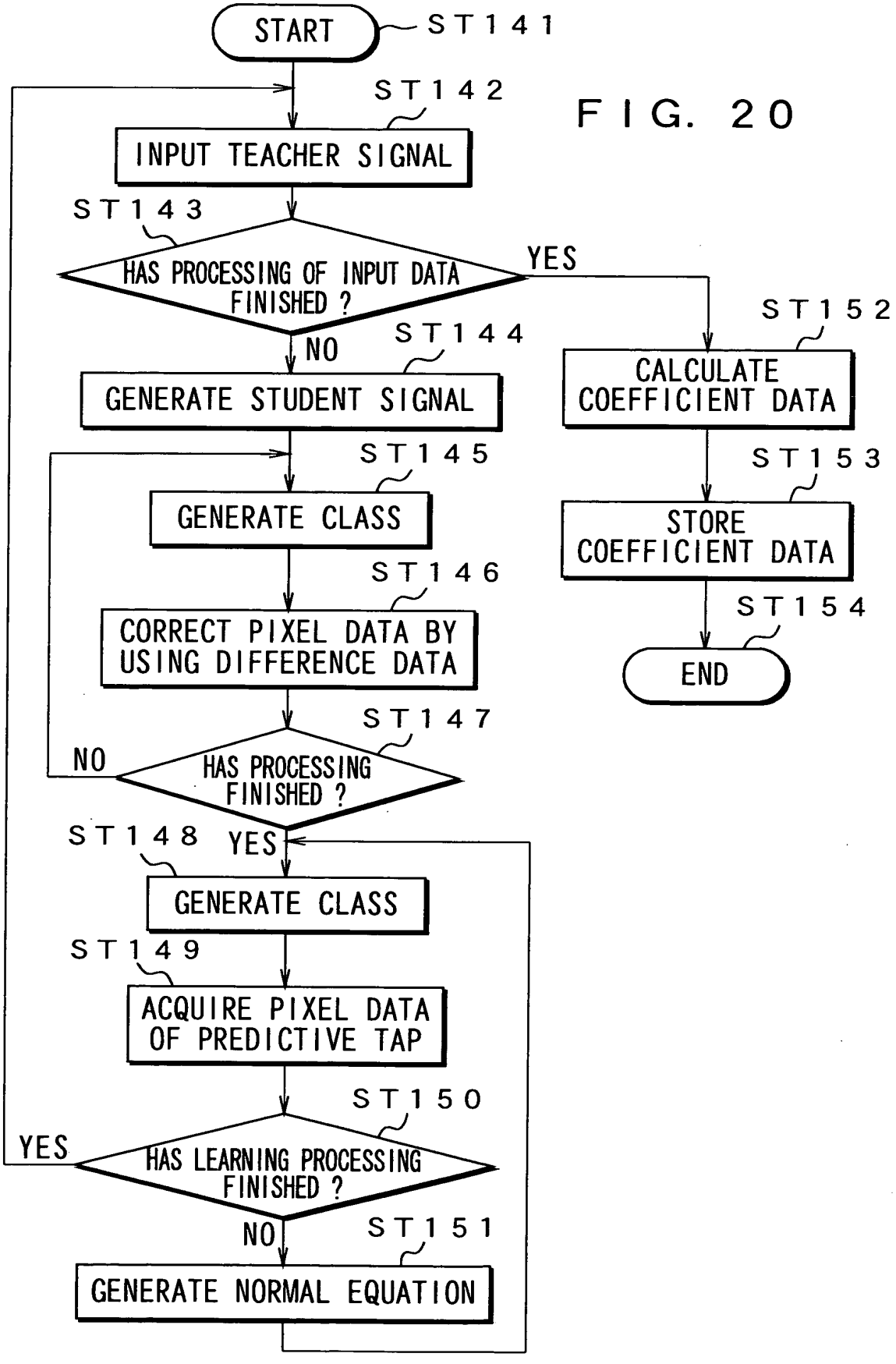

START
ST141
ST142
INPUT TEACHER SIGNAL
ST143
HAS PROCESSING OF INPUT DATA FINISHED ?
YES
NO
ST144
GENERATE STUDENT SIGNAL
ST145
GENERATE CLASS
ST146
CORRECT PIXEL DATA BY USING DIFFERENCE DATA
ST147
HAS PROCESSING FINISHED ?
NO
YES
ST148
GENERATE CLASS
ST149
ACQUIRE PIXEL DATA OF PREDICTIVE TAP
ST150
HAS LEARNING PROCESSING FINISHED ?
YES
NO
ST151
GENERATE NORMAL EQUATION
ST152
CALCULATE COEFFICIENT DATA
ST153
STORE COEFFICIENT DATA
ST154
END

FIG. 20

FIG. 21

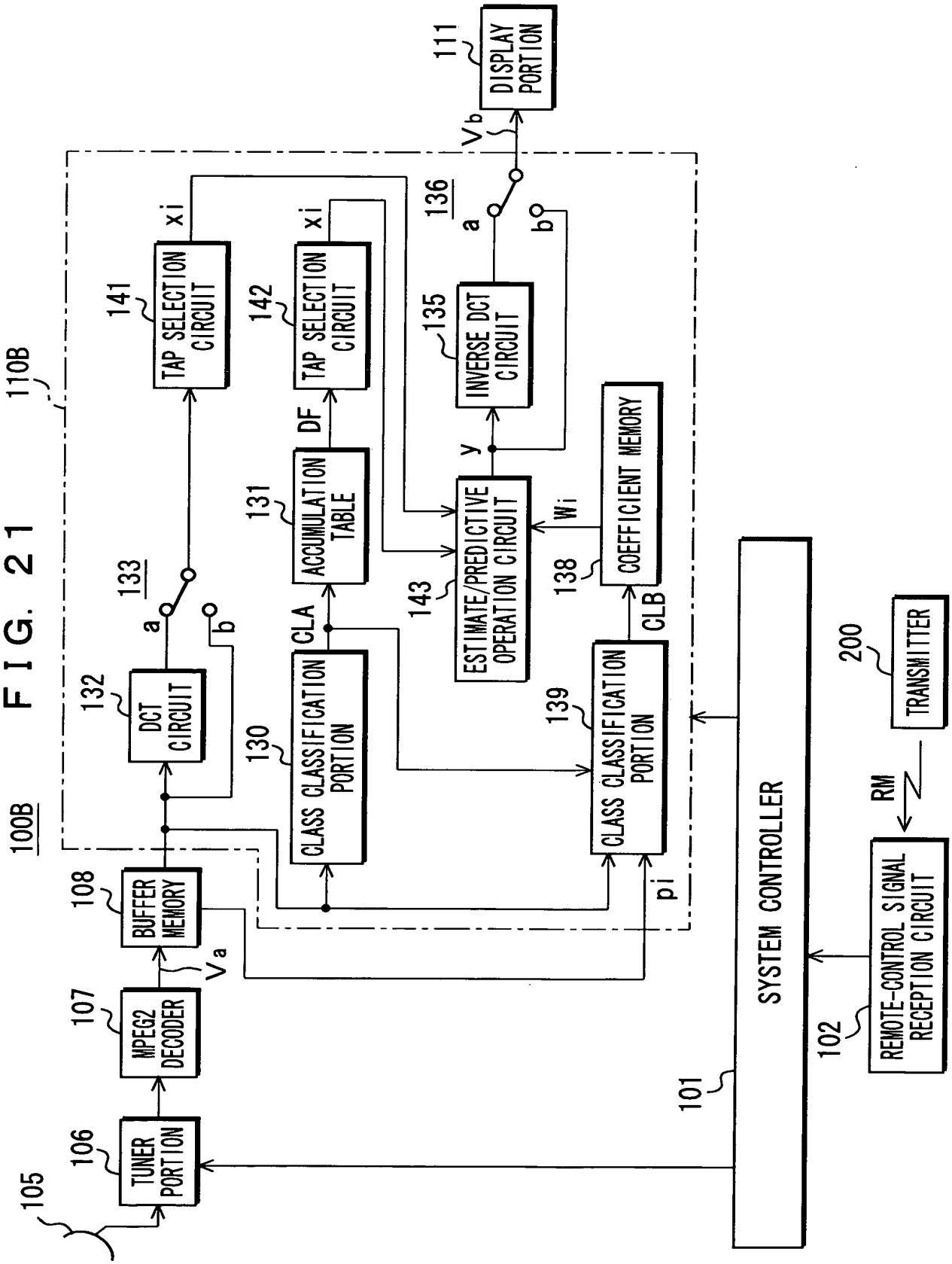

100B
110B
105
TUNER PORTION
106
MPEG2 DECODER
107
BUFFER MEMORY
108
Va
DCT CIRCUIT
132
133
a
b
CLASS CLASSIFICATION PORTION
130
CLA
ACCUMULATION TABLE
131
DF
TAP SELECTION CIRCUIT
141
xi
TAP SELECTION CIRCUIT
142
xi
ESTIMATE/PREDICTIVE OPERATION CIRCUIT
143
y
INVERSE DCT CIRCUIT
135
136
a
b
Vb
DISPLAY PORTION
111
COEFFICIENT MEMORY
138
Wi
CLASS CLASSIFICATION PORTION
139
CLB
pi
SYSTEM CONTROLLER
101
REMOTE-CONTROL SIGNAL RECEPTION CIRCUIT
102
RM
TRANSMITTER
200

FIG. 22

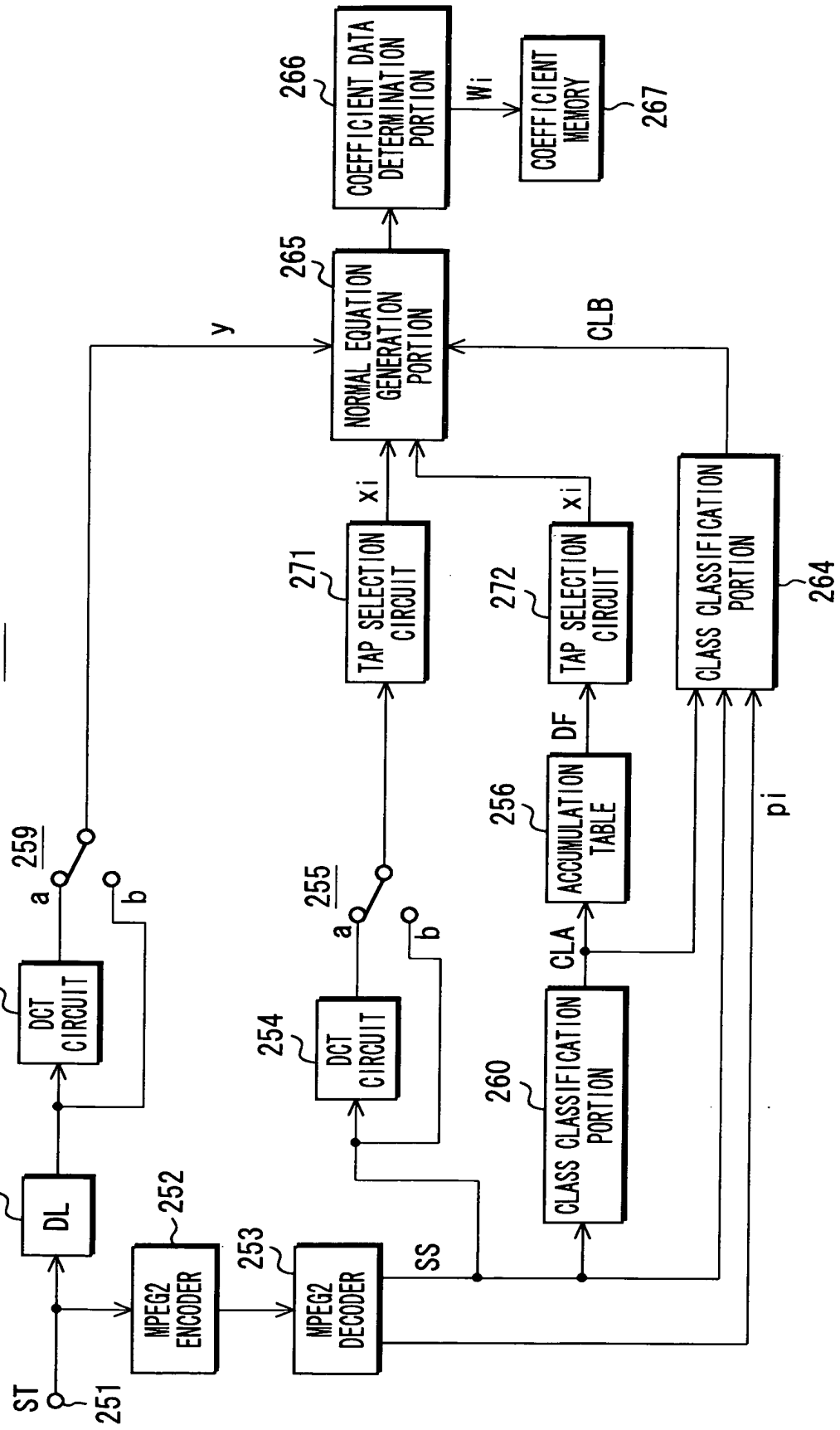
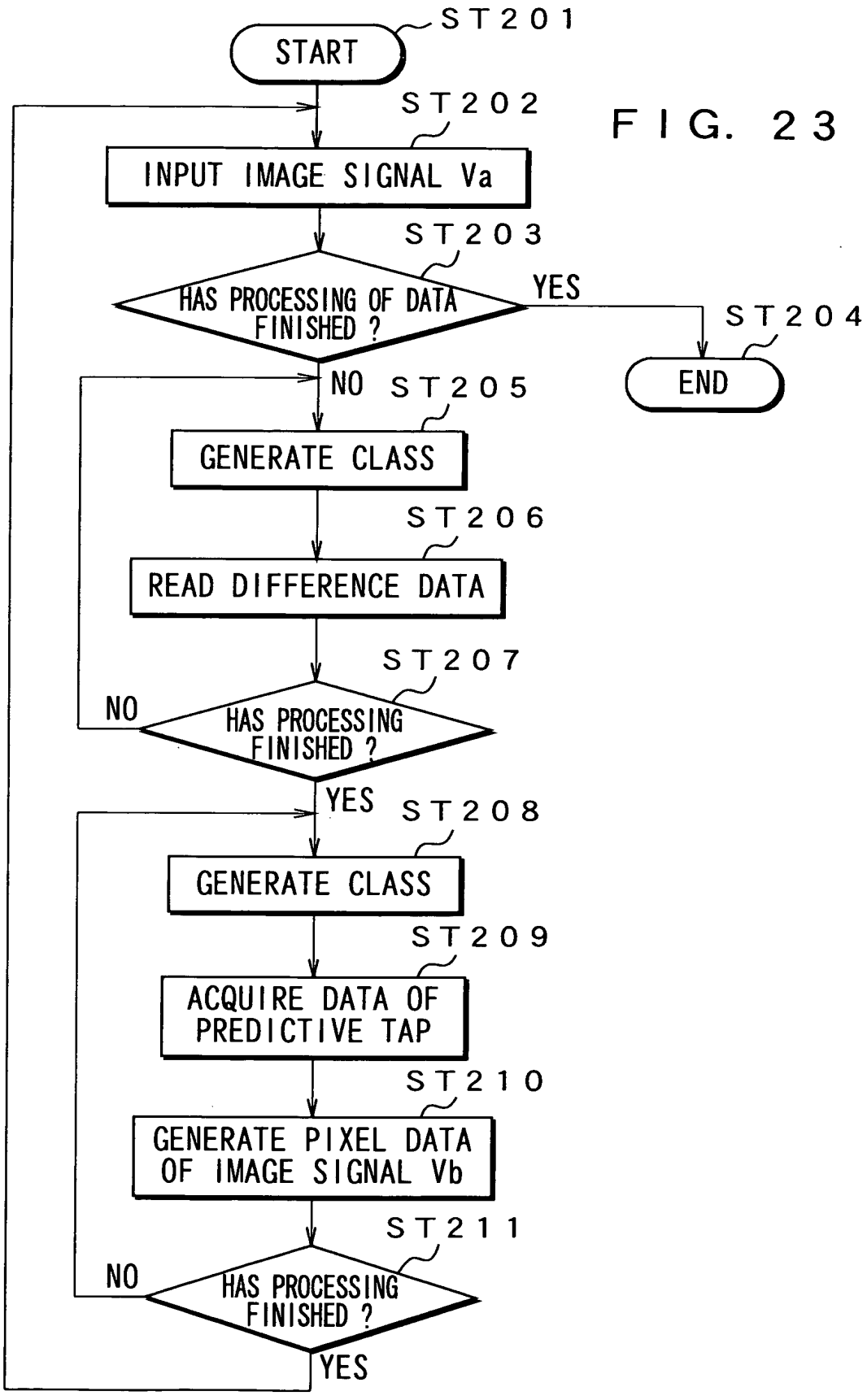

250B
ST
251
MPEG2 ENCODER
252
MPEG2 DECODER
253
DL
257
DCT CIRCUIT
258
259
a
b
DCT CIRCUIT
254
255
a
b
ACCUMULATION TABLE
256
DF
CLASS CLASSIFICATION PORTION
260
CLA
SS
TAP SELECTION CIRCUIT
271
TAP SELECTION CIRCUIT
272
xi
xi
CLASS CLASSIFICATION PORTION
264
pi
NORMAL EQUATION GENERATION PORTION
265
CLB
y
COEFFICIENT DATA DETERMINATION PORTION
266
Wi
COEFFICIENT MEMORY
267

FIG. 23


ST201
START
ST202
INPUT IMAGE SIGNAL Va
ST203
HAS PROCESSING OF DATA FINISHED ?
YES
ST204
END
NO
ST205
GENERATE CLASS
ST206
READ DIFFERENCE DATA
ST207
NO
HAS PROCESSING FINISHED ?
YES
ST208
GENERATE CLASS
ST209
ACQUIRE DATA OF PREDICTIVE TAP
ST210
GENERATE PIXEL DATA OF IMAGE SIGNAL Vb
ST211
NO
HAS PROCESSING FINISHED ?
YES

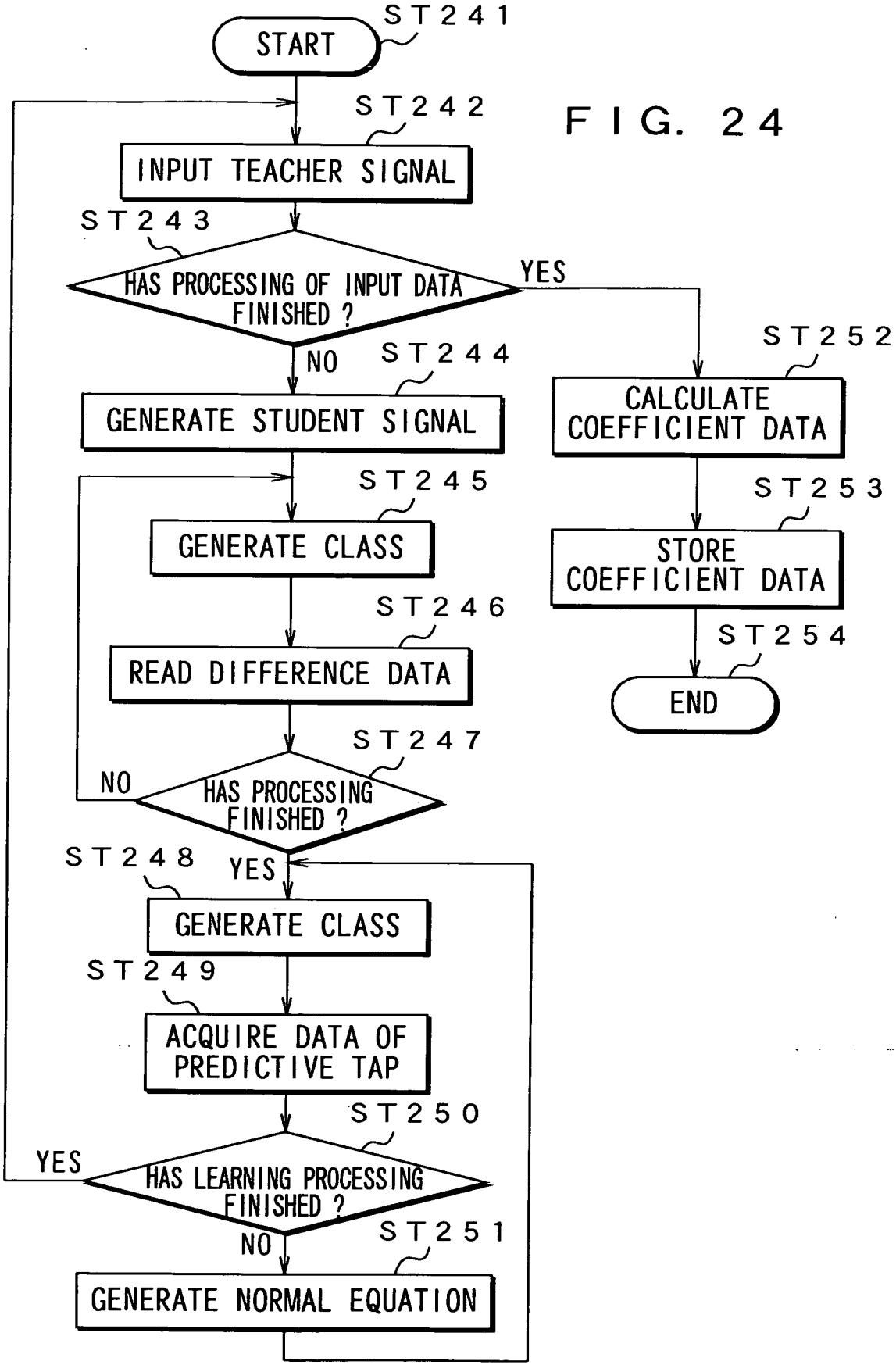

START
ST241
INPUT TEACHER SIGNAL
ST242
HAS PROCESSING OF INPUT DATA FINISHED ?
ST243
YES
NO
GENERATE STUDENT SIGNAL
ST244
GENERATE CLASS
ST245
READ DIFFERENCE DATA
ST246
HAS PROCESSING FINISHED ?
ST247
NO
YES
GENERATE CLASS
ST248
ACQUIRE DATA OF PREDICTIVE TAP
ST249
HAS LEARNING PROCESSING FINISHED ?
ST250
YES
NO
GENERATE NORMAL EQUATION
ST251
CALCULATE COEFFICIENT DATA
ST252
STORE COEFFICIENT DATA
ST253
END
ST254

FIG. 24

FIG. 25

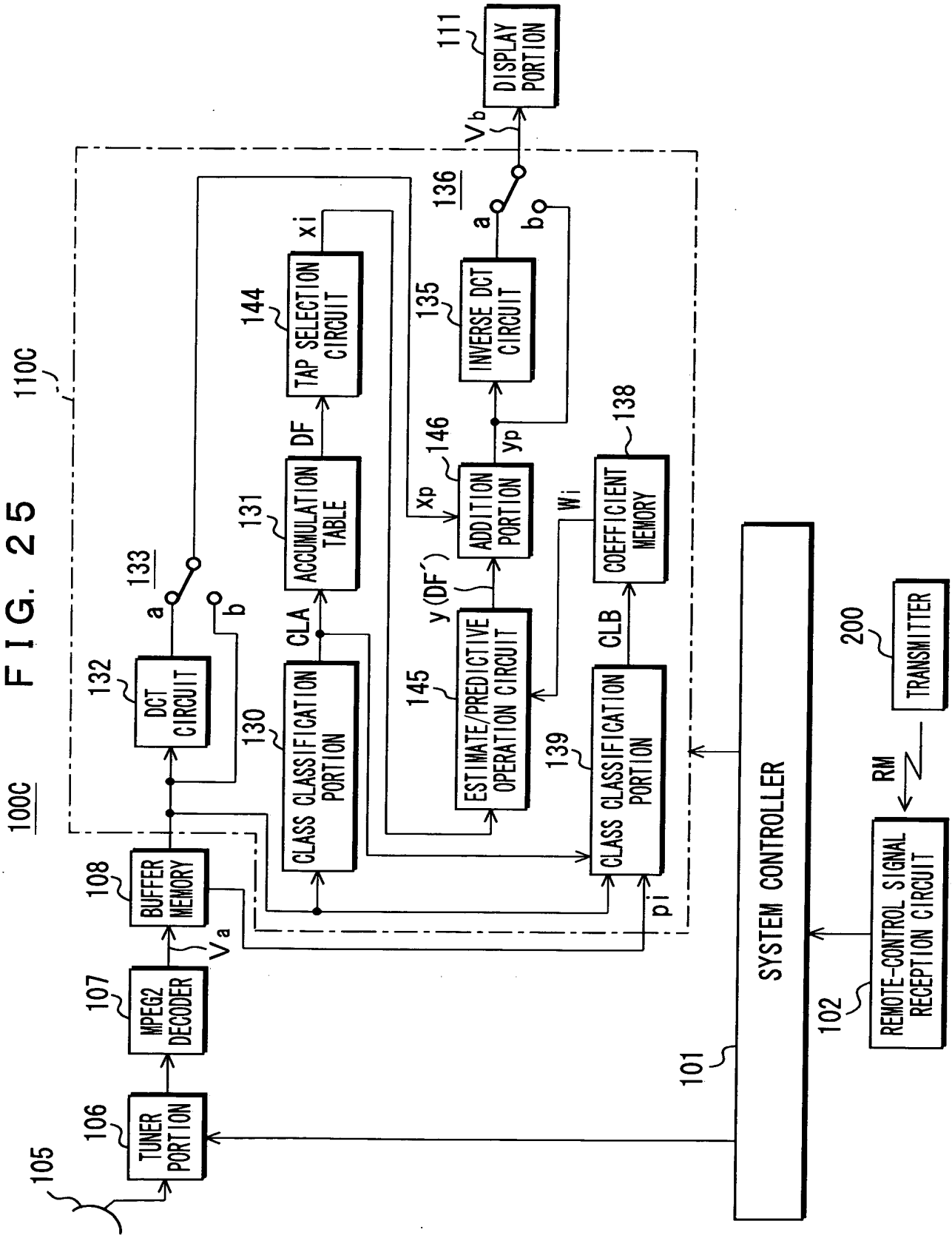
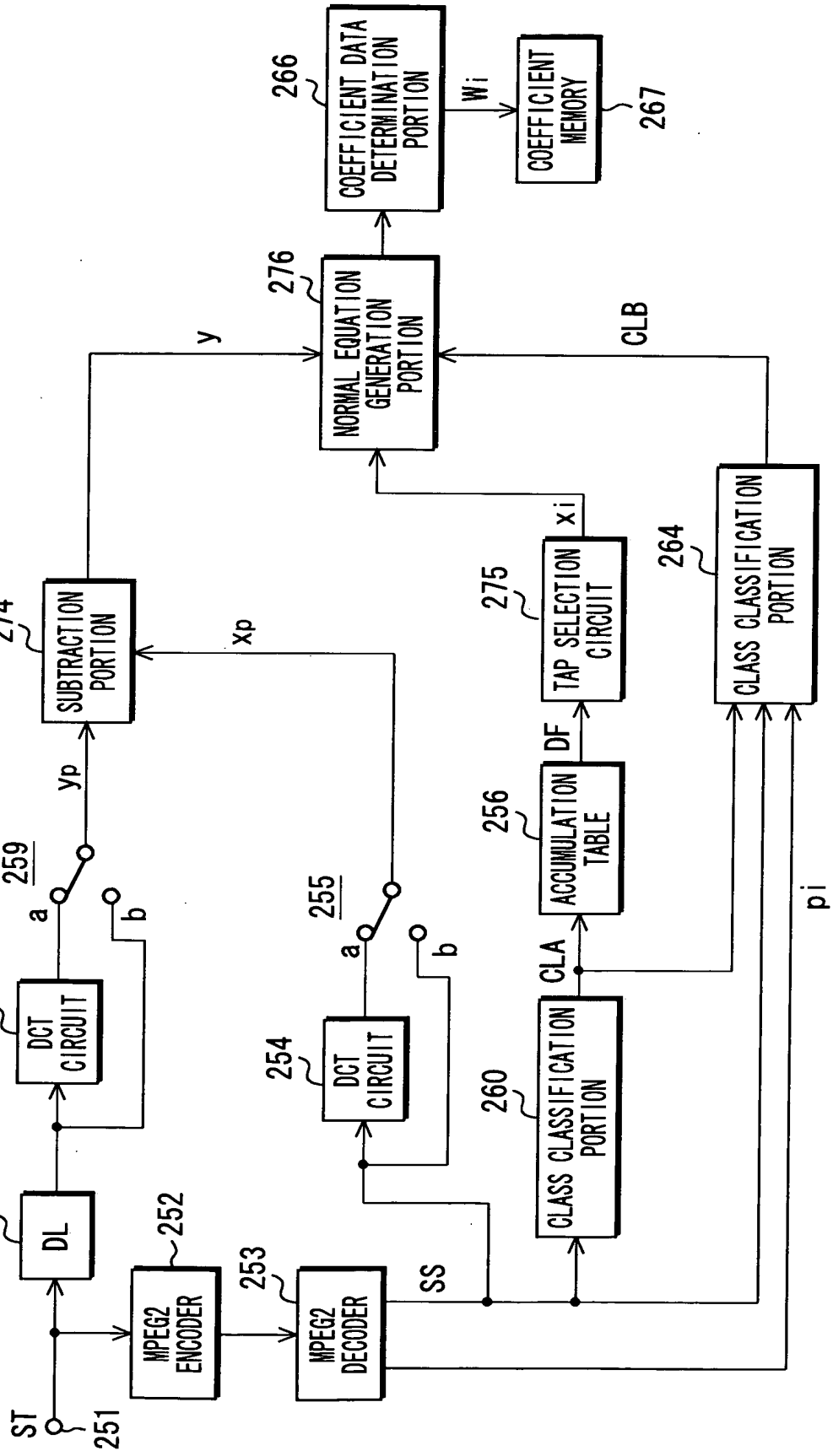

100C
110C
105
TUNER PORTION
106
MPEG2 DECODER
107
BUFFER MEMORY
108
Va
DCT CIRCUIT
132
133
a
b
CLASS CLASSIFICATION PORTION
130
CLA
ACCUMULATION TABLE
131
DF
TAP SELECTION CIRCUIT
144
xi
ESTIMATE/PREDICTIVE OPERATION CIRCUIT
145
y (DF')
Xp
ADDITION PORTION
146
yp
INVERSE DCT CIRCUIT
135
136
Vb
DISPLAY PORTION
111
CLASS CLASSIFICATION PORTION
139
CLB
pi
COEFFICIENT MEMORY
138
Wi
SYSTEM CONTROLLER
101
REMOTE-CONTROL SIGNAL RECEPTION CIRCUIT
102
RM
TRANSMITTER
200

FIG. 26


ST
251
MPEG2 ENCODER
252
MPEG2 DECODER
253
DCT CIRCUIT
254
DCT CIRCUIT
258
DL
257
255
a
b
259
a
b
250C
yp
xp
SUBTRACTION PORTION
274
y
NORMAL EQUATION GENERATION PORTION
276
COEFFICIENT DATA DETERMINATION PORTION
266
Wi
COEFFICIENT MEMORY
267
CLB
xi
TAP SELECTION CIRCUIT
275
DF
ACCUMULATION TABLE
256
CLA
CLASS CLASSIFICATION PORTION
260
SS
CLASS CLASSIFICATION PORTION
264
pi

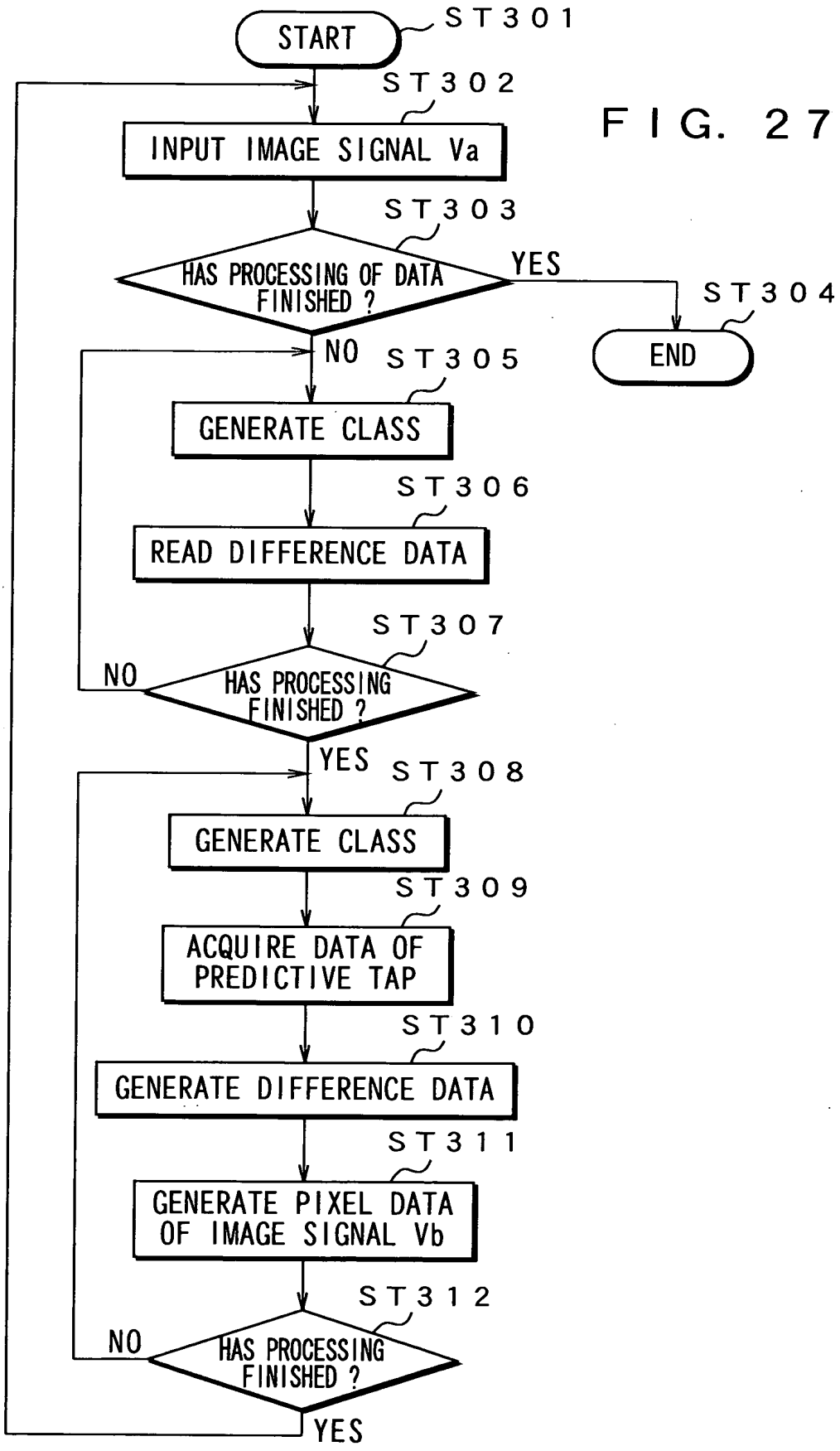

START
ST301
ST302
INPUT IMAGE SIGNAL Va
ST303
HAS PROCESSING OF DATA FINISHED ?
YES
ST304
END
NO
ST305
GENERATE CLASS
ST306
READ DIFFERENCE DATA
ST307
NO
HAS PROCESSING FINISHED ?
YES
ST308
GENERATE CLASS
ST309
ACQUIRE DATA OF PREDICTIVE TAP
ST310
GENERATE DIFFERENCE DATA
ST311
GENERATE PIXEL DATA OF IMAGE SIGNAL Vb
ST312
NO
HAS PROCESSING FINISHED ?
YES

FIG. 27

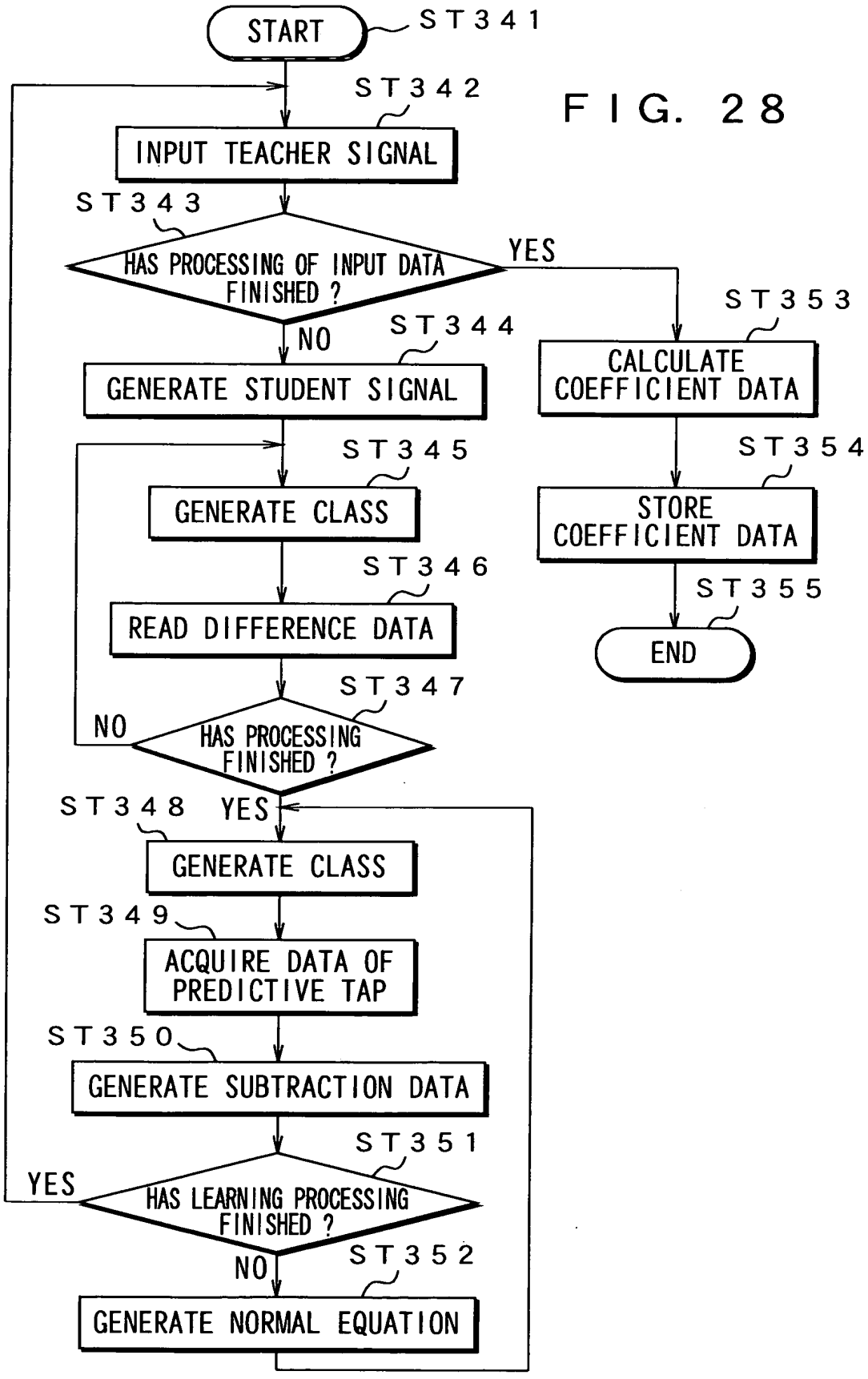

START
ST341
ST342
INPUT TEACHER SIGNAL
ST343
HAS PROCESSING OF INPUT DATA FINISHED ?
YES
NO
ST344
GENERATE STUDENT SIGNAL
ST345
GENERATE CLASS
ST346
READ DIFFERENCE DATA
ST347
NO
HAS PROCESSING FINISHED ?
ST348
YES
GENERATE CLASS
ST349
ACQUIRE DATA OF PREDICTIVE TAP
ST350
GENERATE SUBTRACTION DATA
ST351
YES
HAS LEARNING PROCESSING FINISHED ?
NO
ST352
GENERATE NORMAL EQUATION
ST353
CALCULATE COEFFICIENT DATA
ST354
STORE COEFFICIENT DATA
ST355
END

FIG. 28

FIG. 29

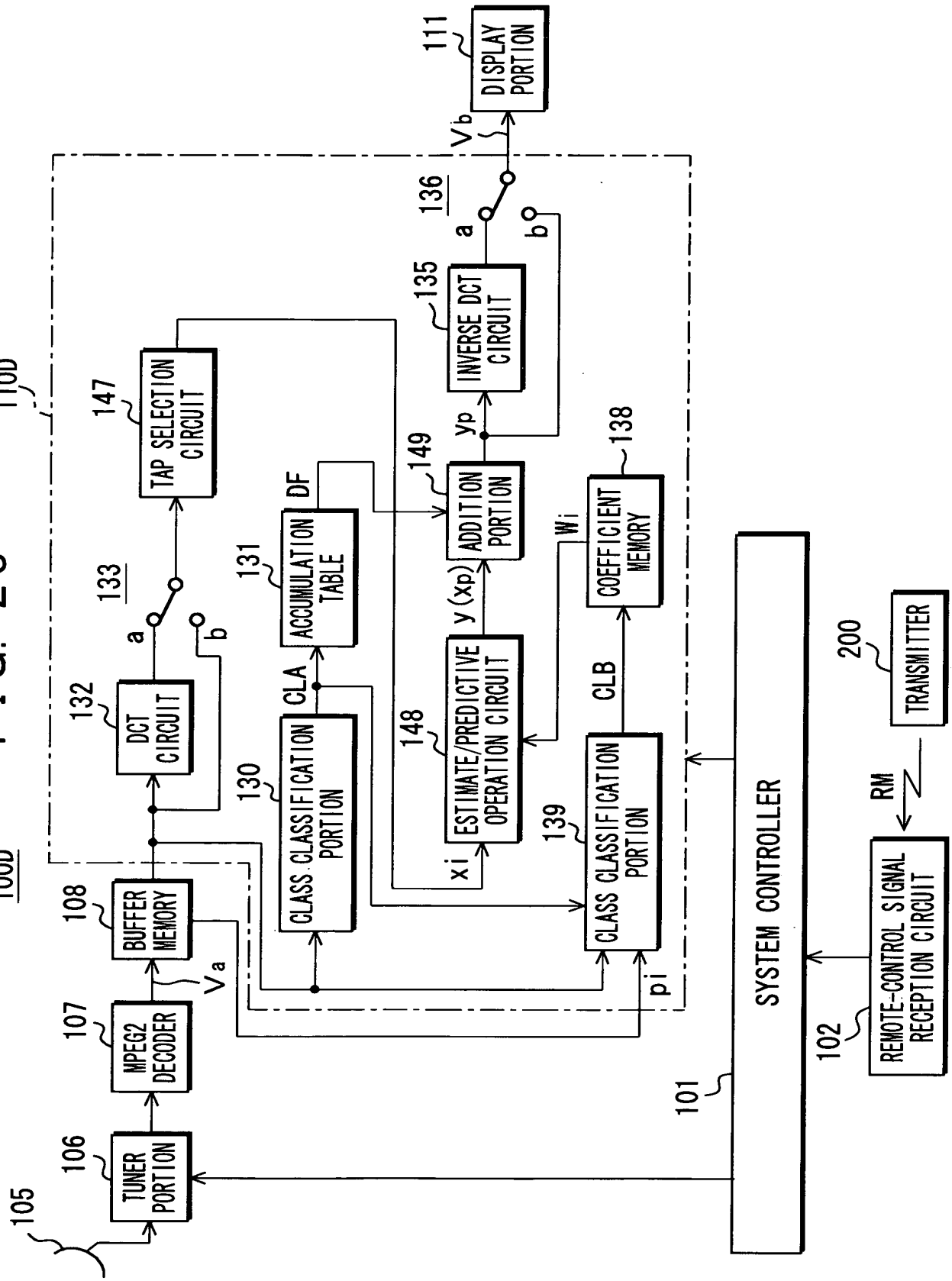
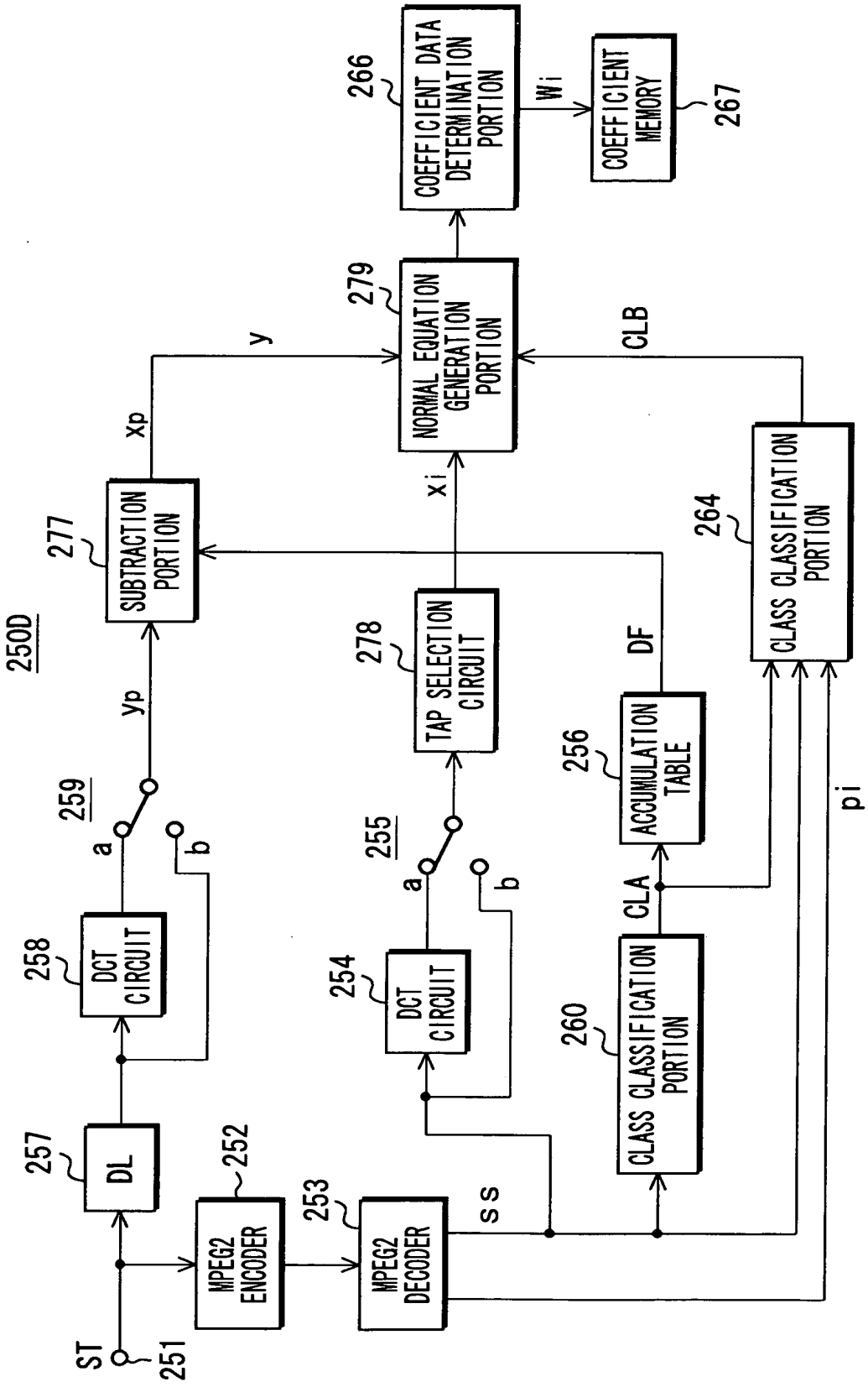

100D
110D
105
TUNER PORTION
106
MPEG2 DECODER
107
BUFFER MEMORY
108
Va
DCT CIRCUIT
132
a
b
133
TAP SELECTION CIRCUIT
147
CLASS CLASSIFICATION PORTION
130
CLA
ACCUMULATION TABLE
131
DF
ESTIMATE/PREDICTIVE OPERATION CIRCUIT
148
y (xp)
xi
ADDITION PORTION
149
yp
INVERSE DCT CIRCUIT
135
136
a
b
Vb
DISPLAY PORTION
111
CLASS CLASSIFICATION PORTION
139
CLB
pi
COEFFICIENT MEMORY
138
Wi
SYSTEM CONTROLLER
101
REMOTE-CONTROL SIGNAL RECEPTION CIRCUIT
102
RM
TRANSMITTER
200

FIG. 30


250D
ST
251
MPEG2 ENCODER
252
MPEG2 DECODER
253
DL
257
DCT CIRCUIT
258
DCT CIRCUIT
254
259
255
a
b
yp
xp
SUBTRACTION PORTION
277
TAP SELECTION CIRCUIT
278
xi
y
NORMAL EQUATION GENERATION PORTION
279
CLB
COEFFICIENT DATA DETERMINATION PORTION
266
Wi
COEFFICIENT MEMORY
267
CLASS CLASSIFICATION PORTION
264
ACCUMULATION TABLE
256
DF
CLA
CLASS CLASSIFICATION PORTION
260
ss
pi

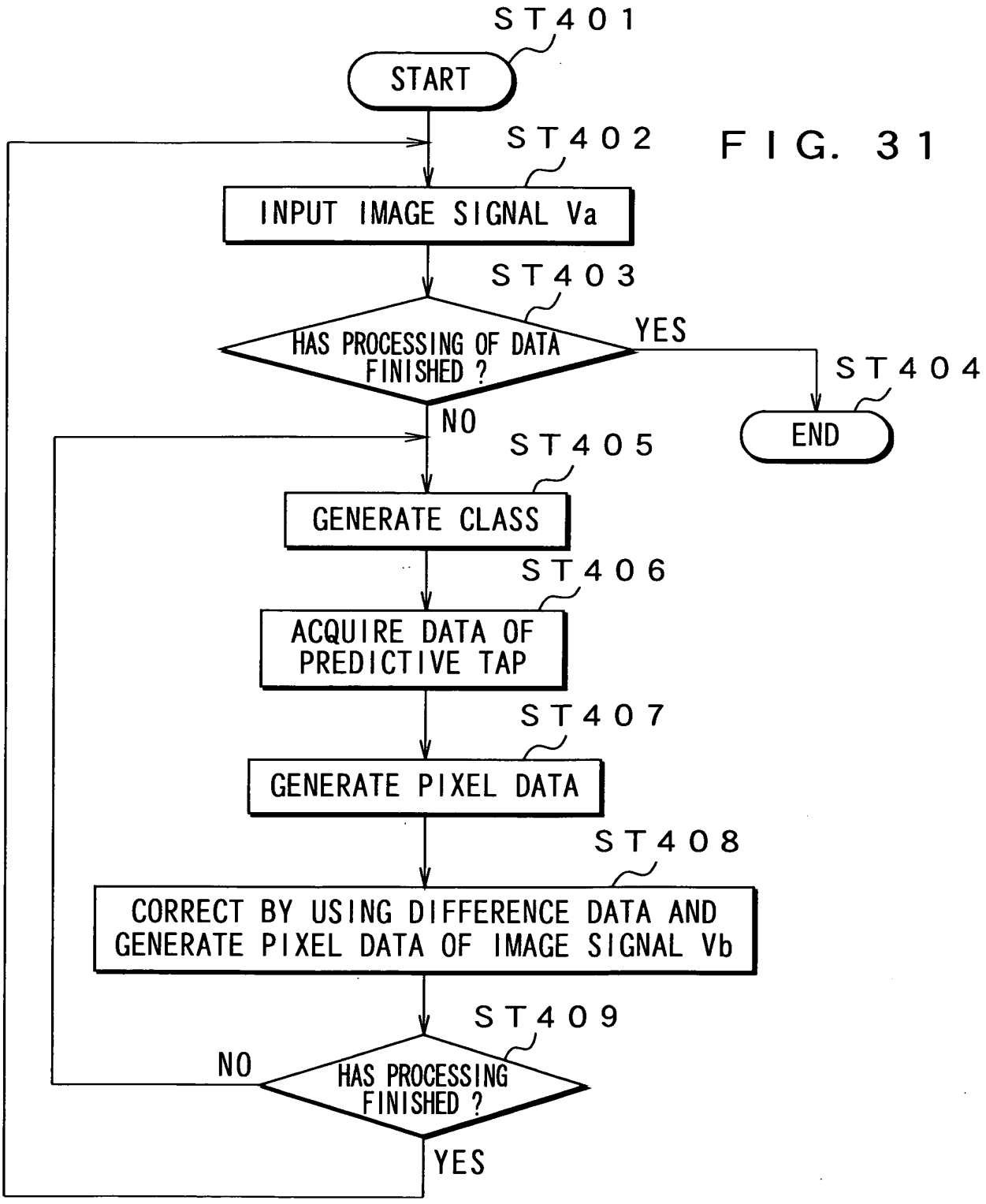

ST401
START
ST402
INPUT IMAGE SIGNAL Va
ST403
HAS PROCESSING OF DATA FINISHED ?
YES
ST404
END
NO
ST405
GENERATE CLASS
ST406
ACQUIRE DATA OF PREDICTIVE TAP
ST407
GENERATE PIXEL DATA
ST408
CORRECT BY USING DIFFERENCE DATA AND GENERATE PIXEL DATA OF IMAGE SIGNAL Vb
ST409
NO
HAS PROCESSING FINISHED ?
YES

FIG. 31

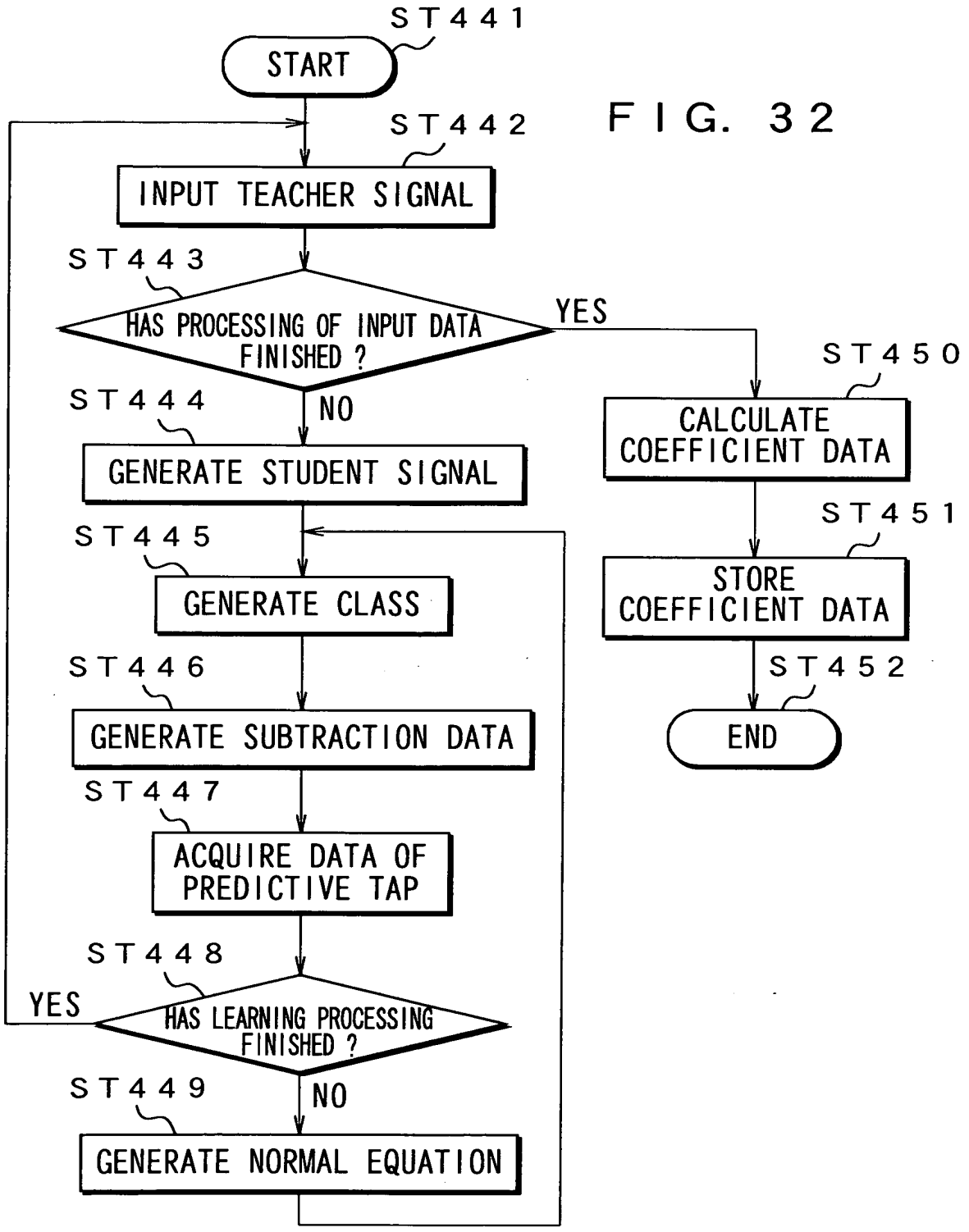

ST441
START
ST442
INPUT TEACHER SIGNAL
ST443
HAS PROCESSING OF INPUT DATA FINISHED ?
YES
NO
ST444
GENERATE STUDENT SIGNAL
ST445
GENERATE CLASS
ST446
GENERATE SUBTRACTION DATA
ST447
ACQUIRE DATA OF PREDICTIVE TAP
ST448
HAS LEARNING PROCESSING FINISHED ?
YES
NO
ST449
GENERATE NORMAL EQUATION
ST450
CALCULATE COEFFICIENT DATA
ST451
STORE COEFFICIENT DATA
ST452
END

FIG. 32